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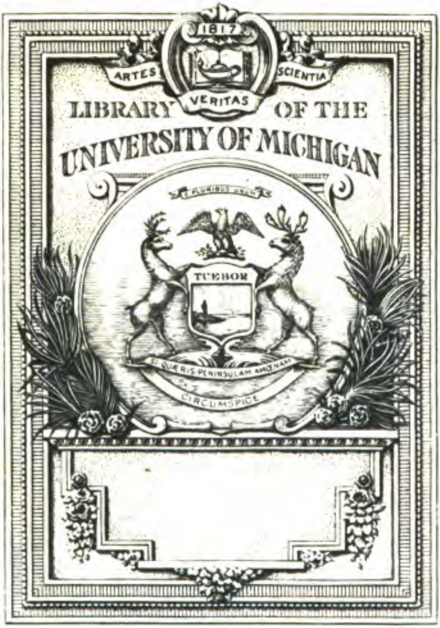

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THE

NEW AMERICAN ARITHMETIC,

IN THE

COIN OF THE UNITED STATES,

DENOMINATED

FEDERAL MONEY;

BEING

A PLAIN AND EASY METHOD OF COMPUTING BY NUMBERS,
PARTICULARLY ADAPTED TO THE CAPACITY OF YOUTH,

Illustrated and Simplified,

FOR THE

USE OF ACADEMIES AND SCHOOLS

IN THE

UNITED STATES.

BY JOHN LYMAN NEWELL,

AUTHOR OF THE AMERICAN STANDARD OF PENMANSHIP.

"He has gained his point, who has blended the sweet with the useful."

HARTFORD:
PRINTED FOR THE AUTHOR.
1822.

DISTRICT OF CONNECTICUT, SS.

L. S.

Be it remembered, that on the Twentieth day of November, in the forty-sixth year of the Independence of the United States of America, **John Lyman Newell**, of the said district, hath deposited in this Office, the title of a book, the right whereof he claims as Author, in the words following, to wit:

" *The New American Arithmetic, in the Coin of the United States,* " *denominated Federal Money, being a plain and easy method of* " *computing by numbers, particularly adapted to the capacity of* " *youth, illustrated and simplified, for the use of academies and* " *schools in the United States. By John Lyman Newell, author* " *of the American Standard of Penmanship.* " *He has gained* " *his point, who has blended the sweet with the useful.*"

In conformity to the Act of the Congress of the United States, entitled, " An Act for the encouragement of learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned."

CHAS. A. INGERSOLL,
Clerk of the District of Connecticut.

A true copy of record, examined and sealed by me,

CHAS. A. INGERSOLL,
Clerk of the District of Connecticut.

E. Clark, *Printer, Middletown.*

Hist. of Science
House
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PREFACE.

For a number of years, the Author has devoted his attention to the instruction of youth; and finding it difficult to give learners an immediate knowledge of Arithmetic by the very laborious and intricate method of reckoning money in pounds, shillings, pence, &c.; and as this method of reckoning is now useless to the citizens of the United States, he has, with much care and attention, designed and prepared the following work for the use of Academies and Schools.

Federal Money being our National Currency, and the present mode of reckoning money of *account* in dollars, cents, and mills, by an Act of Congress, having become general throughout the United States, the Author considers it an important point to have the youth of our country well instructed and familiarized in our own coins; consequently, he has in this work *invariably* adopted the present mode of reckoning money.

Of all coins, Federal Money is the most simple, and the operations in it the most easy; and the Author is convinced, from the result of long and continued experience, that by pursuing a proper method, the knowledge of figures may be acquired in greater perfection, in less time, and with much less trouble, both to the teacher and learner, than on the old plan.

It is too common a fault in elementary works, that they seem rather calculated for a teacher than a learner, and from a very natural cause, that what a person fully understands himself, he readily concludes may be easily comprehended in part by others. Hence, the business of explaining the rudimental parts of all science, has been too much neglected.

It has long been the almost uniform complaint of Instructors, that their pupils do not engage in the study of Arithmetic with that delight with which they usually pursue the other branches of education; which is owing, doubtless in a great measure, to the want of adaptation of this study to their capacity, and the uninteresting manner in which it has generally been treated.

In the following work, the Author has endeavoured to obviate these difficulties by making the subject perspicuous, easy, and peculiarly interesting, and thereby to relieve the pupil from unnecessary perplexity; he has also endeavoured to put him in the readiest way to acquire an extensive knowledge both of theoretical and practical Arithmetic; thereby essentially abridging the time heretofore necessary to be spent in the communication and attainment of such arithmetical knowledge, as is proper for the discharge of business. For this purpose, he has selected the most useful, concise, and explicit rules contained in Arithmetic, several of which are new, and will much facilitate the operation of the examples; and arranged the whole in a manner calculated to facilitate the improvement of youth: he has, likewise, clearly explained the rules, especially those belonging to the fundamental class, and laid them open to the capacity and understanding of the younger class of learners; to conduct which, by an easy and rapid progress from the lowest to the highest and most intricate parts of this branch of common education, is highly important: consequently, it is believed, the compilation will be of lasting and extensive usefulness to all concerned in the business of figures.

One of the leading motives of the Author has been to have the work judiciously arranged in all its parts, and illustrated throughout with clearness and precision; thus learners, by their own industry, may easily acquire a thorough knowledge of this useful study. Much attention has been given to the examples, as well to render the rules perfectly intelligible to the weakest capacity, as for the benefit of individuals in private instruction.

The numerous questions, with their answers, comprised in this work, it is believed, open a field sufficiently extensive for the ingenuity and exercise of the learner; and will lead him into a complete knowledge of all that is useful in this important branch of literature.

Theoretical Arithmetic is given by way of Question and Answer, as being in this way more readily committed to memory, and better understood by the pupil, than the abstruse method in which the science of Arithmetic has generally been written.

Appropriate names are given to the terms made use of in most of the rules, and are pointedly distinguished for the ready notice of the pupil.

The examples have been collected from various sources of intelligence, exhibiting a variety of historical and other interesting facts, which are calculated to arrest the attention of the pupil, and afford him much satisfaction in his progress. And thus whilst the science not only becomes a pleasing and important study to him, he is at the same time accumulating a fund of new ideas, and gaining intelligence of various important relations, remarkable transactions, and distinguished events.

The characters made use of in this work immediately precede Notation.

The art of Notation being explained in its simplest form; the art of Numeration immediately succeeds, having received a very copious and minute explanation, together with three Numeration Tables, each of which is differently and clearly illustrated; also the method of writing down numbers in figures, as well as in words, a good understanding of which, is highly necessary to the pupil on his commencing the study of Arithmetic.

The first example in each of the *fundamental* rules, and in most of the others, has received a full and complete illustration, rendering the nature of the various steps and operations of Practical Arithmetic capable of being understood by those of the feeblest comprehension.

Of those rules in which several cases occur, the first example contained in each case, has the method of operation particularly pointed out.

Wherever an example occurs which is in any degree calculated to embarrass the mind of the pupil, a Note of explanation is given for his guide, stating the method of operation.

Federal Money and Decimal Fractions being so nearly allied to whole numbers, that addition, subtraction, multiplication, and division of Federal Money and Decimal Fractions, are arranged immediately after those rules of the same name in whole numbers: they being of so simple a nature, and so essentially necessary to be understood by all, exclusive of the great advantage which the pupil will derive from such an arrangement, will justify the adoption in this work, which will readily be perceived on applying it to practice.

In Decimal Fractions, an illustration is given, showing the manner in which a decimal essentially decreases by having cyphers placed at the left hand; and also a Decimal Table is given, showing at once how a decimal may either be increased or diminished.

As multiplication and division of Federal Money have generally been but imperfectly treated of, and as imperfectly understood, a full explanation of those rules is given in this work, to bring them within the capacity of youth.

Numerous examples for finding the value of Goods, when the price of one yard, pound, &c. is given, to find the value of the whole quantity, (which renders the rule of Practice useless;) and also examples for finding the amount of bills of Parcels, immediately succeed multiplication of Federal Money. Examples for finding the value of Goods, when the price of the whole quantity is given to find the price of one yard, pound, &c., are arranged next after division of Federal Money.

In order to give the learner some idea of fractions, a few examples in addition, subtraction, multiplication, division, and reduction of Fractions or Broken Numbers, are given directly after division of Decimals. A complete illustration is given, showing into how many parts a whole number may be divided. The pupil, by paying a little attention to them, will find the method of operation extremely easy.

In the method by which the Fundamental Rules are arranged in most treatises of this kind, the pupil is hurried from addition to subtraction, from thence to multiplication, division, &c. before he has acquired a full understanding of either rule; and thus the object in view, to his mind becomes confused, and is in a great measure defeated. To obviate the above difficulty, is the design of this *new* arrangement of the rules in the subsequent work.

Compound Multiplication and Division immediately precede Reduction, as it is essential that the learner be well versed in those two rules before he enters upon the exercises of Reduction.

The rule of Single Proportion made use of in this work, renders the method of stating examples in the same, peculiarly simple and concise, by which, together with the great variety of examples therein contained, the pupil will derive the most essential and satisfactory advantage.

In addition to the rule commonly made use of in computing Interest, a *new* one is given; the latter being preferable to the former, both for perspicuity and facility.

In a work of this nature, perfect accuracy, perhaps, can scarcely be expected; errors of the Press, or those of the Author, may have escaped correction: however, it is believed, that in the following work, no material error will be found; as the whole has been executed at the expense of much care and attention, and the press carefully watched.

The Author, having given a general description of his work, ardently indulges the hope that it will prove of extensive advantage to the youth of our country, and relieve the labours of those who devote their time and attention to their education. How far he has succeeded in the attempt, is referred to the judgment of an enlightened and impartial public, by

Their most obedient servant,

J. L. NEWELL.

Writing Academy, New-London, Sept. 1821.

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EXPLANATION

OF THE

CHARACTERS MADE USE OF IN THIS TREATISE.

Q. What do *two parallel horizontal lines* signify ?

A. Two parallel horizontal lines signify *Equality ;* that is, whatever *precedes* them, is equal to whatever *succeeds* them ; as 100 cts.=1 doll., signify that 100 cents, are *equal* to 1 dollar ; or, as 6 and 8=14, signify that 6 and 8, are *equal* to 14.

Q. What does *St. George's Cross*, or *a perpendicular* and *a horizontal line* crossing each other at right angles, signify ?

A. St. George's Cross signifies *Addition ;* as 6+8=14, signify that 6 and 8, are equal to 14.

Q. What does *one horizontal line* signify ?

A. A horizontal line signifies *Subtraction ;* as 8—6=2, signifies that 6 subtracted from 8, leaves, or is equal to 2.

Q. What does *St. Andrew's Cross*, or *two diagonal lines* crossing each other, signify ?

A. St. Andrew's Cross signifies *Multiplication ;* as 8×6=48, signify that 8 multiplied by 6 is equal to 48.

Q. What does *a horizontal line* drawn *between two points*, signify ?

A. A horizontal line between two points, signifies *Division ;* as 48÷6=8, signifies that 48 divided by 6, is equal to 8.

Q. What do *four Points* placed in the middle of *four Numbers* denote ?

A. Four points denote them *to be proportional* to one another by *Single Proportion ;* as 2 : 4 : : 6 : 12, that is, 2 bears such proportion to 4, as 6 does to 12.

ARITHMETIC.

Question. WHAT is Arithmetic?

Answer. Arithmetic is the art or science which treats of numbers.

Q. Of how many kinds does Arithmetic consist?

A. Arithmetic consists of two kinds, *Theoretical* and *Practical.*

Q. What does Theoretical Arithmetic teach?

A. Theoretical Arithmetic explains the nature and quality of numbers, and demonstrates the reason of practical operations. In this sense, Arithmetic is a *Science.*

Q. What does Practical Arithmetic teach?

A. Practical Arithmetic shows the method of working by numbers, so as to be most useful and expeditious for business. In this sense, Arithmetic is an *Art.*

NOTATION.

Q. What is Notation?

A. Notation is the art of expressing numbers by certain characters, of which there are two methods, viz. the *Arabic method* by Figures, and the *Roman method* by Letters.

Q. By what are numbers expressed in the Arabic method?

A. Numbers are expressed in the Arabic method by the ten following figures, viz.

One.	Two.	Three.	Four.	Five.	Six.	Seven.	Eight.	Nine.	Cypher.
1	2	3	4	5	6	7	8	9	0

Q. What are these figures called ?

A. The nine first figures are called *Digits*, and the tenth is called *Cypher*.

Q. What does a Digit express when standing alone ; and what value has it ?

A. A Digit expresses a certain number ; and has only a *simple value*, as 1 signifies *one*, 2 signifies *two*, &c. But the *Cypher* standing alone has no value.

Q. What does it require to express any number exceeding nine ; and what value has it ?

A. To express any number more than nine, it requires *two* or *more* of these figures standing together ; and any such number has a *local value*, as 16 signifies *sixteen*, 20 signifies *twenty*.

Q. By what are numbers expressed in the Roman method ?

A. Numbers in the Roman method are expressed by letters ; thus,

One	I	is	1	XIV	is	14	XC	is	90
Two	II	=	2	XV	=	15	C	=	100
	III		3	XVI		16	CC		200
	IV		4	XVII		17	CCC		300
	V		5	XVIII		18	CCCC		400
	VI		6	XIX		19	D		500
	VII		7	XX		20	DC		600
	VIII		8	XXX		30	DCC		700
	IX		9	XL		40	DCCC		800
	X		10	L		50	DCCCC		900
	XI		11	LX		60	M		1000
	XII		12	LXX		70	MDCCCXX		1820
	XIII		13	LXXX		80			

Q. Does a less literal number, placed either before or after a greater, alter its value ?

A. If a less literal number be placed *before* a greater, it diminishes its value ; but if placed *after it*, augments its value ; thus, IV is 4—VI is 6—IX is 9—XI is 11, &c.

NUMERATION.

Q. What is Numeration, and what does it teach ?

A. Numeration is the *art of numbering* ; and teaches the different *value* of figures by their different places, and how to *write* or *read* any number by the *ten Arabic figures.*

Q. Where do you begin in setting down numbers for arithmetical operations?

A. It is usual in arithmetical operations to begin at the *right hand* and proceed towards the *left;* thus, to write the sum 1829, set down the right hand figure, thus 9; next set down the *two* at the left of the nine, thus 29; then set down the *eight* at the left of the two, thus 829; lastly, set down the *one* at the left of the eight, thus 1829, equal to the proposed sum. Next it is to be observed, that there are *four places* meaning the situations of the four different figures, and each of these places has an appropriate name, viz. the *first figure* at the right hand is called *unit's place;* the *second, ten's place;* the *third, hundred's place;* and the *fourth, thousand's place.*

Q. Suppose there were more figures connected, what would their places be called?

A. If more figures be connected, the *next* would be *tens of thousands,* then *hundreds of thousands,* &c. Each figure has a different signification according as it happens to occupy one or another of these places.

Q. What is the value of the unit figure in any sum?

A. The unit figure in any sum is just what it expresses when standing alone; but each of the other figures has a different signification from its natural meaning; and the next figure towards the left hand expresses so many *tens* as it signifies *units* when standing alone; *i. e.* is *ten times* its simple value; and so on for every removal from the *right hand* towards the *left.*

Q. What are the *Terms* in Numeration?

A. The words used as Terms in Numeration, are *Integer, Prefix,* and *Annex.*

Q. What is meant by *Integer, Prefix,* and *Annex?*

A. By *Integer,* is meant a simple or whole number. *Prefix* means to place *before.* *Annex,* to place *after.*

Q. Does a cypher placed at the left hand of a figure (or figures,) either increase or diminish its value?

A. A cypher placed at the left hand does not increase or diminish the value; but placed at the right hand of a figure (or figures,) it augments the value of that figure (or figures) *ten times*, or in the same *tenfold ratio* as would any other figure; thus, 5 with a cypher annexed, signifies (50) *fifty;* with *two* cyphers annexed, it signifies (500) *five hundred.*

Q. What does the following Table illustrate?

A. The following Table more fully illustrates how the cypher, when placed at the right hand of a figure, augments it.

FIRST NUMERATION TABLE.

Thous. of M.	Hunds. of M.	Tens of M.	Millions.	Hunds. of T.	Tens of T.	Thousands.	Hundreds.	Tens.	Units.	
									1	= One.
								1	0	= Ten.
							1	0	0	= One Hundred.
						1	0	0	0	= One Thousand.
					1	0	0	0	0	= Ten Thousand.
				1	0	0	0	0	0	= One Hundred Thousand.
			1	0	0	0	0	0	0	= One Million.
		1	0	0	0	0	0	0	0	= Ten Million.
	1	0	0	0	0	0	0	0	0	= One Hundred Million.
1	0	0	0	0	0	0	0	0	0	= One Thousand Million.

Q. What does the Cypher denote?

A. The Cypher denotes the *want* of a number as shown in the above Table.—This Table also shows that every cypher annexed, increases the value of the figure on its left, *tenfold.*

Q. What is the following Table intended to show?

A. The following Table is intended to show that any figure placed in the second column from the right, is *ten times* the value as when placed in the first; and when placed in the third, is *ten times* the value as when placed in the second, and *one hundred times* the value as when placed in the first, &c.

SECOND NUMERATION TABLE.

Tens of Trillions.	Trillions.	Hunds. of T. of B.	Tens of T. of B.	Thous. of B.	Hunds. of B.	Tens of B.	Billions.	Hunds. of T. of M.	Tens of T. of M.	Thous. of M.	Hunds. of M.	Tens of M.	Millions.	Hunds. of T.	Tens of T.	Thousands.	Hundreds.	Tens.	Units.
6	9,	8	0	2,	4	9	5,	8	1	3,	7	2	5,	9	4	3,	6	7	8

Q. How is the signification of the figures composing the preceding Table to be known?

A. The words over the Table show the signification of those figures against which they stand; and the figures show how many of that signification are meant. Thus, *units*, in the first place, signify *ones*, and 8 standing against it, shows that *eight ones* are here meant; *tens*, in the second place, shows that every figure in this place means so many *tens*, and 7 standing against it, shows that *seven tens* are here meant, equal to *seventy*, the real signification of the figure; *hundreds*, in the third place, shows that every figure in this place means so many *hundreds*, and 6 standing against it, shows that *six hundreds* are here meant; and in this manner is known the value of each remaining figure in the Table.

Q. Should the figures be pointed off into periods?

A. In large numbers, it is very convenient to point the figures into periods, and it is often practised in *public offices*; and by *men of business*, to point off any number of figures into periods of *three figures each;* then the left hand figure of every *three* thus pointed off, is either *hundreds of units, hundreds of thousands, or hundreds of millions*, &c.

Q. Are the words over the Table applicable to any sum?

A. The words over the tables are applicable to any sum, and must be committed to memory from *right* to *left*; thus, *units*, *tens*, *hundreds*, *thousands*, &c.; and then the figures must be read from *left* to *right* according to the *names* over them.

Q. For what are *billions*, *trillions*, &c. substituted?

A. *Billions* are substituted for *millions of millions*; *trillions*, for *millions of millions of millions*, &c. By the following Table, any number of figures is more easily known.

THIRD NUMERATION TABLE.

X. of Millions,	Millions,	C. of Thousands,	X. of Thousands,	Thousands,	Hundreds,	Tens,	Units,	
							1	= One.
						1	1	= Eleven.
					2	2	1	= Two hundred twenty-one.
				5,	3	3	1	= Five thousand 331.
			9	6,	4	4	1	= Ninety-six thousand 441.
		7	2	5,	5	5	1	= 725 thousand 551.
	8,	4	6	9,	1	7	7	= 8 millions 469 thousand 177.
9	9,	9	9	9,	9	9	9	= 99 millions 999 thousand 999.

Q. What is the method of writing down numbers in figures?

A. At the right hand, begin and write *units* in the *unit's place*, *tens* in the *ten's place*, *hundreds* in the *hundred's place*, &c. writing each figure in its proper value in numeration; taking care to supply those places of the natural order with *cyphers* where a number is *wanting*: Thus, *two hundred* and *four*, is written 204.

EXAMPLES.

NOTE.—One half of the numbers here given in words, is expressed in figures; the other half is left for exercises of the pupil.

Five.	=	5
Six.		
Eight.		8
Ten.		
Fourteen.		14
Nineteen.		
Twenty.		20
Sixty-seven.		
Eighty-one.		81
One hundred.		
One hundred, and one.		101
Nine hundred, and forty.		

Nine hundred, and fifty-three. = 953
One thousand, and three.
One thousand, and nineteen. 1019
Five thousand, and five.
Seven thousand, and seven. 7007
Eight thousand, one hundred and six.
Eight thousand, four hundred and four. 8404
Ninety thousand, two hundred and sixty.
Ninety-nine thousand, and eleven. 99011
One hundred thousand, one hundred and one.
Three hundred thousand, and three hundred. 300300
Seven hundred thousand, and ninety-five.
Eight hundred thousand. 800000
Nine hundred thousand, and nine.
Two millions, two thousand, and two. 2002002
Ninety-one millions, and six hundred.
Nine hundred millions, and ninety. 900000090
One thousand millions, one hundred and one.

Q. What is the method of writing down numbers in words?

A. Begin with the left hand figures, and write them down in words at full length from the highest place given through the whole, writing down the lowest place last; and wherever a cypher is given, the number wanting in that place is not expressed: Thus, 10 is written *ten*.

EXAMPLES.

NOTE.—One half of the numbers here given in figures, is expressed in words; the other half is left for exercises of the pupil.

4 = Four.
7
9 Nine.
12
15 Fifteen.
29
30 Thirty.
51
63 Sixty-three.
70
77 Seventy-seven.
98
100 One hundred.

109 =	
110	One hundred, and ten.
239	
408	Four hundred, and eight.
1001	
1011	One thousand, and eleven.
1111	
1101	One thousand, one hundred, and one.
1110	
10000	Ten thousand.
10007	
11011	Eleven thousand, and eleven.
44444	
47900	Forty-seven thousand, nine hundred.
56798	
100000	One hundred thousand.
333322	
440004	Four hundred, forty thousand, and four.
999919	
6006006	Six millions, six thousand, and six.
110421860	
111000900	One hundred eleven millions, and nine hundred.

PRINCIPAL RULES OF ARITHMETIC.

Q. What are the *Principal Rules* of Arithmetic?

A. The principal rules of Arithmetic are *Addition*, *Subtraction*, *Multiplication*, and *Division;* which *four* embrace the *whole art of Arithmetic.*

Q. How are these *Rules* divided?

A. The Rules of Arithmetic are divided into two kinds; *simple* and *compound.*

Q. When are they *simple;* and when *compound?*

A. The Rules are *simple*, when the numbers are all of *one denomination;* and *compound*, when they are of *several denominations.*

Q. What are all *other* rules and operations in Arithmetic?

A. All the other rules in Arithmetic are nothing more than various uses and repetitions of these *four rules.*

Q. What is the *object* of every Arithmetical operation?

A. The object of every Arithmetical question is, by certain given quantities which *are known*, to find out others which *are unknown*; and by one or the other of the above operations *only*, numbers can be changed, *i. e.* either by *increasing* or *decreasing* their quantities.

SIMPLE ADDITION.

Q. What is Simple Addition?

A. Simple Addition is the adding together of several numbers of the same denomination into one amount; thus 2 dollars, 5 dollars, and 8 dollars, added together, make 15 dollars.

Q. What is the Term in Simple Addition; and how is it found?

A. The Term is *Amount;* and is found by adding several numbers together.

RULE.

Q. How do you write down numbers to be added?

A. To write down numbers to be added, place units under units, tens under tens, &c. and draw a line underneath.

Q. Where do you begin to add a sum?

A. To add a sum, begin with the unit figures, and add up their column.

Q. How do you proceed, if the *amount* of the unit column be less than *ten?*

A. If the amount of the unit column be less than ten, write it underneath the unit column; but if it be *ten*, or an *exact number* of tens, *write a cypher*, and *carry one* for *every ten* contained in the *amount*, to the next column.

Q. If the amount *exceed* ten, or any exact number of tens, how is it to be set down?

A. If the amount exceeds tens, &c. write down the *excess* above tens, *i. e.* set down the *right hand figure* of the *amount*, and *carry* the *left hand figure* (or figures) to the column of *tens;* add it thereto, which is *carrying one* for *every ten* contained in the *amount* of the unit column; and so proceed through all the columns contained in the *sum*, except the last, of which, the *whole amount* must be set down.

PROOF.

Q. How is Simple Addition proved?

A. To prove Simple Addition, add the figures from the top *downwards* as they were added *upwards*, and the *last amount*, if the work be right, will be equal to the *first*.

NOTE.

Q. What is the reason of carrying one for every ten, in all simple numbers, in preference to any other number?

A. It is because *ten* in an inferior column, is just equal to *one* in a superior column.

Q. Of what use is Addition?

A. The use of Addition is to find the *exact amount* of several numbers.

ADDITION TABLE.

Q. How is the following Addition Table to be read?

A. Begin at the left hand column, and read thus:— 2 and 2 are 4; 2 and 3 are 5; 2 and 4 are 6, &c.

2+	2=	4	3+	7=	10	5+	5=	10	7+	7=	14
2	3	5	3	8	11	5	6	11	7	8	15
2	4	6	3	9	12	5	7	12	7	9	16
2	5	7	3	10	13	5	8	13	7	10	17
2	6	8	3	11	14	5	9	14	7	11	18
2	7	9	3	12	15	5	10	15	7	12	19
2	8	10	4+	4=	8	5	11	16	8+	8=	16
2	9	11	4	5	9	5	12	17	8	9	17
2	10	12	4	6	10	6+	6=	12	8	10	18
2	11	13	4	7	11	6	7	13	8	11	19
2	12	14	4	8	12	6	8	14	8	12	20
3+	3=	6	4	9	13	6	9	15	9+	9=	18
3	4	7	4	10	14	6	10	16	9	10	19
3	5	8	4	11	15	6	11	17	9	11	20
3	6	9	4	12	16	6	12	18	9	12	21

EXAMPLES.

Note.—The method of proceeding in Simple Addition illustrated.

1. What is the amount of 9381 dollars, 1900 dollars, 745 dollars, and 2 dollars, when added together?

Note.—Here are four numbers given for exercises in Addition; two of them contain *units, tens, hundreds, thousands;* another of them contains *units, tens, hundreds;* and the other contains only *units.* To prepare these numbers for the operation of Addition, is to write them down, units under units, tens under tens, &c. as in the following manner.

Tens of Thous.	Thousands.	Hundreds.	Tens.	Units.	
	9	3	8	1	dollars.
	1	9	0	0	dollars.
		7	4	5	dollars.
				2	dollars.
1	2	0	2	8	Amount, or answer.
1	2	0	2	8	2d amount, or proof.

Note.—To find the answer or amount of the numbers here given to be added, begin at the bottom of the unit column, and say 2 and 5 are 7, but 0 is nothing, and 1 is 8, which *amount* (8) being *less* than *ten*, set down directly under the column added. Proceed to the next column, and say, 4 is 4, but 0 is nothing, and 8 is 12, which *amount* (12) is an *excess* of 2 over an *even* number of *tens;* therefore set down 2 under the column, and carry 1 for the *ten* to the 7 in the next column, and say, 1 added to 7 is 8, and 9 are 17, and 3 are 20, which *amount* (20) being an *even* number of *tens*, set down a 0 under the column, and carry 2 for the *two tens* to the next column, and say, 2 added to 1 is 3, and 9 are 12; this being the *last* column, set down the whole amount (12,) placing the 2 directly under the column, and carrying the 1 and setting it in the next place, (which being the *tens of thousand's* place,) and the work is done. To prove the sum, reckon the figures from the top downwards, and *carry one* for *every ten* as before.

2.	3.	4.	5.
2 2 2 2	3 3 3 3	4 4 4 4	1 1 1 1
2 2 2 2	3 3 0 3	4 0 0 4	1 6 5 1
1 1 1 1	1 1 2 0	4 0 0 4	1 6 5 1
2 2 2 2	4 4 0 0	4 0 0 4	1 6 5 1
2 2 2 2	1 1 6 6	4 4 4 4	1 6 5 1

6. *Dollars.*	7. *Pounds.*	8. *Yards.*
561728	610903	908190
561728	600603	907790
561728	600603	980090
561728	901603	988190

9. *Gallons.*	10. *Miles.*	11. *Eagles.*
777777	100001	123456
710707	999990	987657
755667	444440	123458
740407	555550	607829
777777	100001	543210

12. *Bushels.*	13. *Days.*	14. *Acres.*
1456078	11	7654321
6078	182	912600
6078	9999	29168
78	11111	4042
56078	100000	753
1456078	1234567	10

15. Add 24679+74204+35780+71250+ and 47809 together. *Amount* 253722.

NOTE.—This mark (+) signifies that all the numbers which it connects must be added together.

16. Add 352077, 890123, 462034, and 7234 together. *Amount* 1711468.

17. What is the amount of 946501, 1290, 74589, 9467, 89457, and 200? *Ans.* 1121504.

18. What is the amount of 687, 201, 96, 960, 476, 9467, 1001, and 2? *Ans.* 12890.

19. Find the amount of 986497, 46798, and 4690. *Ans.* 1037985.

20. What is the amount of the following numbers? viz. 245, 791, 300, 401, 790, 674, 974, 789, 340, and 471. *Ans.* 5775.

21. What is the total amount of the following numbers? viz. 7930330, 4942162, 9767251, 5476601, 1694240, 189091, and 234. *Ans.* 29999909.

22. What is the am't. of 622121212337, 191311501466, 297632202703, and 46194605? *Ans.* 1111111111111.

23. Two numbers being given, whose difference is 382, and the less number 97464: What is the greater number? *Ans.* 97846.

24. The least of two numbers is 20989, and the difference between them 46092: What is the greater number, and what is the amount of both numbers?

Ans. { 67081 Greater number.
88070 Amount of both num.

Note.—In the above sum, first find the greater number, and then the amount of both numbers.

25. George Washington was born in the year 1732, and lived 67 years: In what year did he die?

Ans. 1799.

26. Add twenty, thirty-five, forty-one, ninety-seven, one hundred and three, seven hundred and fifty-six together. *Ans.* One thousand and fifty-two.

27. Add nineteen, one hundred and nineteen, one thousand and one, twenty-six thousand four hundred and fifteen, four hundred and six together. *Ans.* 27960.

28. Add one, two, three, four, five, six, seven, seventeen, ninety, twenty, forty-five, and ninety together.

Ans. Two hundred and ninety.

29. What is the amount of the following numbers? viz.

Ninety-nine millions, two hundred and seventy-five thousand and seven.
One million, eight hundred and two thousand, three hundred and sixty-one.
Sixty-five thousand, nine hundred and seventy-seven.
One hundred millions, six hundred and forty-four thousand and four.

Ans. 201787349.

30. In 1819, there were in the town of Hartford, during the month of January, 4 deaths, February 10, March 6, April 4, May 4, June 2, July 3, August 8, September

4, October 9, November 4, and December 3: How many deaths were there during the year? *Ans.* 61.

31. In 1810, there were in the *first* and *second Societies* of Hartford, 55 deaths; in 1811, 65; in 1812, 63; in 1813, 122; in 1814, 128; in 1815, 93; in 1816, 107; in 1817, 93; in 1818, 85; and in 1819, 61: What was the whole number of deaths during these ten years?

Ans. 892.

32. The number of Depositors in the Savings Bank in New-York in Feb. 1820, were as follows, viz. Minors 563; Widows 98; Orphans 20; Apprentices 15; Clerks 65; Cooks 35; Counsellors at Law 2; Clergymen 4; Domestics 143; Doctors of Medicine 5; Bakers 11; Farmers 12; Grocers 15; Laborers 27; Merchants 12; Mantua-makers 14; Nurses 15; Porters 15; Printers 17; Seamen 20; Shipmasters 7; Seamstresses 34; Shoemakers 21; Students 6; Tailors 21; Tailoresses 13; Waiters 14; other professions and occupations 303: What was the whole number of Depositors? *Ans.* 1527.

33. North America is 4500 miles in length, and the same in breadth; South America is also the same in length, and 3000 miles in breadth: What is the length of the continent of America?

Ans. Nine thousand miles.

34. The length and circumference of the principal Lakes in the U. States, are as follows, viz. Superior is 400 miles in length, and 1500 in circumference; Huron is 250 in length, and 1000 in circumference; Michigan is 300 in length, and 755 in circumference; Erie is 200 in length, and 700 in circumference; Ontario is 150 in length, and 450 in circumference; Champlain is 200 in length, and 415 in circumference: What is the amount of all the lengths, and likewise of all the circumferences?

Ans. { 1500 miles in length.
4820 miles in circum.

NOTE.—In the above sum, first find the amount of the lengths, and then of the circumferences.

35. The principal Cataracts in the U. States are as follows, viz. Niagara 150 feet perpendicular; Tennessee 90; Potomac 70; Passaic 70; St. Anthony on the Mississippi 80; Cohoes on the Mohawk 60: What is the amount of the whole? *Ans.* 520 feet.

36. The length of the following Rivers in the United

States, and the distance they are navigable, are as follow, viz. Mississippi navigable 2000 miles, length 3000 miles; St. Lawrence navigable 500, length 2000; Potomac navigable 300, length 500; Hudson navigable 170, length 250; Rappahannock navigable 110, length 200; James navigable 75, length 500; Delaware navigable 75, length 300; Connecticut navigable 50, length 300; Kennebec navigable 46, length 250; Penobscot navigable 40, length 300; York navigable 35, length 250; Taunton navigable 23, length 50; Savannah navigable 18, length 375; Merrimac navigable 16, length 80: What is the amount of the navigable distance of the whole, and likewise of their length?

Ans. 3458 miles, navigable distance.
8355 miles, whole length.

NOTE.—In the above sum, first find the amount of the navigable distances, and then of the whole lengths.

37. In 1819, the maritime forces of Europe consisted of 400 ships of the line, 88 ships of 50 guns, 348 frigates, and 1563 vessels of an inferior class: Of how many vessels did the forces consist? *Ans.* 2399.

38. In 1818, there were in London 407 places of public worship, 237 parish charity schools, 3813 seminaries for education, 8 societies for the express purpose of promoting morals, and 12 societies for promoting the learned, the useful, and the polite arts: What was the entire number of them? *Ans.* 4477.

39. The National Armory at Springfield, (Mass.) was commenced in 1795; and from that time to Dec. 31st, 1819, there were completed in that manufactory, 152559 new muskets, 1202 new carbines, and 46414 muskets repaired: The amount of purchase money, for lands, stores, shops, mill-seats, machinery, &c. was estimated at 166136 dollars; other expenses, for the above period, exclusive of stock, and parts of work on hand, amounted to 1906450 dollars: What was the whole number of muskets and carbines made and repaired; and likewise the total amount of expenditures, from the commencement of the works, to Dec. 31st, 1819?

Ans. 200175 muskets, &c.
2072586 dollars.

40. In a little more than two years preceding 1819,

Mr. Van Ess distributed among Catholics 233341 copies of his translation of the New Testament, and among Protestants 5334 Bibles and 2800 Testaments: What was the whole number of them? *Ans.* 241475.

41. A return of slaves released by Admiral Lord Exmouth, at Algiers, by virtue of the treaty of the 28th of August, 1816, viz. Neapolitans 471, Sicilians 236, Romans 173, Tuscans 6, Spaniards 161, Portuguese 1, Greeks 7, Dutch 28: What was the whole number of slaves released? *Ans.* 1083.

42. At Cadiz on the 8th Nov. 1819, there were 101 deaths, and 10913 sick; on the 9th, 90 deaths, and 10294 sick; on the 10th, 99 deaths; and on the 11th, 105 deaths, and 10037 sick: What were the whole number of deaths, and likewise of the sick?

Ans. { 395 deaths.
31244 sick.

43. In 1818, there were at work on the great N. York canal, 3000 men, 500 span of horses, and 200 yoke of oxen: What was the total number of men, horses, and oxen? *Ans.* 4400.

44. The ship Sally Ann from Smyrna, arrived at Boston with a cargo consisting of 1753 casks and 1432 drums of raisins, 200 cases, 400 half cases, and 2226 drums of figs, 9 cases of opium, 24 cases of wine, 14 bales of galls, 8 cases of gum arabic, 6 bales of hare-skins, 8 do. of seneca, 2 cases of gum myrrh, 2 do. of gum ammoniac, 45 bags of filberts, 4 drums of scammony, and 51 bags of walnuts: What was the entire number of casks, drums, cases, &c. of which the cargo consisted? *Ans.* 6184.

45. The improvements made in the city of New-York, in 1818, were estimated as follows, viz. begun or finished nine Churches; a public Seminary or Free School; an Asylum for Mental Infirmity; two Markets; 3000 Dwelling Houses and Stores: What was the entire number of them? *Ans.* 3013.

46. The number of inhabitants in North America is calculated at 14 millions, South America 13 millions and 28 thousand, Europe 179 millions and 665 thousand, Asia 500 millions, and Africa 30 millions: What is the whole number of them? *Ans.* 736693000.

47. The distance from New-London to Hartford is

follows, viz. from New-London to Waterford 5 miles, from thence to Montville 3 miles, New-Salem 6 miles, Colchester 6 miles, Marlborough 8 miles, Glastenbury 10 miles, Hartford 5 miles: What is the whole distance? *Ans.* 43 miles.

48. The distance from Hartford to Albany is as follows, viz. to Farmington 6 miles, Canton 7, New-Hartford 6, Sandisfield 14, Lenox Coffee-House 22, New-Lebanon 12, Philipstown 9, Union Village 7, Albany 11: What is the whole distance? *Ans.* 94 miles.

49. The distance from Albany to Utica is as follows, viz. to Schenactady 14 miles, Amsterdam 16, Cauknawauga 9, Johnston 7, Palatine 14, Manheim 3, Little Falls 7, Herkimer 7, Schuyler 6, Utica 10: What is the whole distance? *Ans.* 93 miles.

50. The distance from Utica to Canandaigua is as follows, viz. to New-Hartford 4 miles, Westmoreland 7, Vernon 3, Lenox 10, Sullivan 7, Manlius 7, East-Hill (Pompey) 9, West-Hill 5, Marcellus 3, Nine-Mile-Creek 5, Skeneatelus 5, Auburn 6, Cayuga 4, Geneva 5, Gorham 10, Canandaigua 6: What is the whole distance? *Ans.* 96 miles.

51. What is the distance from Canandaigua to Buffalo, it being 6 miles to East-Bloomfield, 5 to West-Bloomfield, 5 to Lima, 8 to Avon, 7 to Caledonia, 18 to Batavia, and 36 to Buffalo? *Ans.* 85 miles.

52. The distance from Canandaigua to Genesee River is 27 miles, from thence to Batavia 27, Buffalo Creek 36, Chippeway 19, Niagara Falls 3: What is the whole distance? *Ans.* 112 miles.

53. The distance from New-York to Boston by way of Springfield is 235 miles; from New-Londen to Boston 100; New-London to New-Haven 53; from Boston to Portland 119; from New-York to Washington 232; Post-road from Boston to Hartford 98; Middle road from Boston to Hartford 91; from Hartford to New-Haven through Middletown 42; from Providence to Hartford 74; from New-York to Hartford 112: What is the amount of the whole? *Ans.* 1156 miles.

54. During the year ending May, 1818, the British Foreign Bible Society published 5000 Irish Bibles in the Roman character; 5000 Dutch do. and 5000 Dutch Testa-

ments; 5000 French and English do; 5000 Italian do., and in May preceding, they had preparing 10000 German pocket Testaments; 5000 Portuguese Bibles, and 10000 do. Testaments; 5000 Irish Testaments in the native character; 5000 Malay Bibles in Roman character, and 10000 Malay Testaments; 1000 Syriac Old Testaments and Hindostanee New Testaments: What is the above total number? *Ans.* 71000

55. In 1818, the New-York Sunday-School Union Society reported the whole number of its schools to be 34, which were conducted by 50 superintendents, 359 teachers, and 3500 scholars were on the roll: What was the whole number of superintendents, teachers, and scholars? *Ans.* 3909.

56. About the time the Romans besieged Jerusalem, they killed 20000 Jews at Cæsarea, 13000 at Scythopolis, 50000 at Alexandria, 10000 at Damascus, and at some other places they massacred the whole: How many did they kill at those four places? *Ans.* 93 thousand.

57. In 1819, there were raised on the New Alms-House farm in Salem, (Mass.) 325 bushels of corn, 235 bush. of barley, 3138 bush. of potatoes, 225 bush. of onions, and 250 bush. of turnips: What was the whole number of bushels raised? *Ans.* 4173.

58. The following are the issues from the depository of the American Bible Society in Feb. 1820, viz. Bibles 2007; Testaments 1899; Gospels of St. John, in Mohawk, 30; Epistles of John, in Delaware, 250: What was the whole number issued? *Ans.* 4186.

59. The following is the number of waggons, horses, &c., which crossed the Cove mountain, between M'Connelsburg and Loudon, (Pa.) from Dec. 1st, 1817, to Nov. 30th, 1818, viz. 9834 waggons, 621 carriages and carts, 52318 waggon and carriage horses, 7719 single horses, 5500 cattle, and 2000 sheep: What was the entire number of them? *Ans.* 77992.

60. The diameter of the Sun is 883000 miles, of the planet Jupiter 89170, of Saturn 79042, of the Earth 7964, and of the Moon 2161: What is the amount of all their diameters? *Ans.* 1061337 miles.

61. In Dec. 1818, about 700 men formed a hunting party, and, after encircling large numbers of game in the

township of Wysox, (Pa.) attacked and killed, in one day, 300 deer, 5 bears, 9 wolves, and 11 foxes, and it was calculated that 500 deer, 19 bears, and 20 wolves escaped: What was the number encircled? *Ans.* 864.

62. The following is a catalogue of the Students of Yale College in Nov. 1818, viz. Resident Graduates 29, Senior Sophisters 43, Junior Sophisters 72, Sophomores 82, Freshmen 68: What was the total number? *Ans.* 294.

63. The convicts in the state prison (N. Y.) in Dec. 1818, were as follows, viz. 116 men weavers, 62 quillers and spoolers, 19 spinners, twisters, and carders, 4 gear makers, 6 dyeing and sizing yarn, 9 reelers and winders, 104 shoe-makers, 7 closers and binders, 1 cutting out shoes, 9 turners, 8 preparing chair stuff, 14 brush-makers, 3 coopers, 6 blacksmiths, 12 carpenters, 9 tailors, 3 painters, 5 sawyers, 79 stone-cutters, 8 labourers, 12 oakum pickers, 1 fur cutter, 8 cooks and bakers, 2 gardener and ostler, 12 waiters in halls, 4 do. in front, 4 barbers and gate-keepers, 3 whitesmiths, 2 logwood cutters, 2 stocking weavers, 1 sewing stocking, 1 engraver, 1 reed maker, 1 picker, 1 C. machine, 8 attendants in wearing shop, 4 clerks, 1 assistant physician, 1 superintendent, 18 sick, 5 in cells, 10 confined in rooms, 14 women washers, 8 sewers, 1 spinner, 5 sick, 2 invalids, 1 waiter, 2 do. in front: What was the whole number? *Ans.* 619.

64. The following is the number and description of animals, killed by 33 persons in Nelson, (N. H.) who hunted 6 days, viz. 45 foxes, 10 hedgehogs, 2791 squirrels, 18 crows, 44 woodchucks, 148 woodpeckers, 6 hawks, 20 bluejays, 14 blackbirds, 9 threshers, and 4 polecats: What was the total number killed? *Ans.* 3109.

65. A farmer gleaned after harvest, by the use of horse-rakes the following amount of rye, viz. from 10 acres, 14 bushels; from 9 acres, 6 bushels; from 7 acres, 8 bushels; from 7 acres, 10 bushels; from 4 acres, 3 bushels; from 10 acres, 12 bushels; from 6 acres, 7 bushels: What was the amount of acres raked, and bushels gleaned? *Ans.* { 53 Acres. 60 Bushels.

66. The distance from Buffalo to Detroit is as follows,

viz. from Buffalo to Erie, (formerly Presque Isle,) 90 miles, from thence to Fair Port, (Grand River,) 80, Cleaveland 30, Sandusky 60, Put-in-Bay, (the harbour of Perry's fleet near the scene of his battle and victory,) 30, Detroit 30 : What is the whole distance ?

Ans. 320 Miles.

67. In 1820, there were, in the State of New-York, 6000 common schools, in which were taught 300000 children, and 160000 dollars were annually appropriated to the compensation of the teachers ; there were 20 Lancastrian schools, and 40 Academies ; in the latter there were 2218 students, of whom 688 studied Latin and Greek, and the appropriation was 320000 dollars : the Colleges, (Columbia, Union, and Hamilton,) had 522 students, the two Medical Colleges had 196 students, and the grants to them were 720000 dollars : What was the whole number of children, students of Academies, and students of Colleges ; and also the whole amount of dollars appropriated and granted to the schools, Academies, and Colleges ?

Ans. { 302936 Children and Students.
1200000 Dollars.

68. The number of the *militia* of the U. States in 1820, was as follows, viz. New-Hampshire contained 26203, Mass. and Maine 74088, Vermont 20731, Rhode-Island 8567, Connecticut 23346, New-York 121553, New-Jersey 35240, Pennsylvania 115231, Delaware 7451, Maryland 32189, Virginia 85967, N. Carolina 49782, S. Carolina 33729, Georgia 29561, Alabama 10315, Louisiana, 9894, Mississippi 5297, Tennessee 40000, Kentucky 52883, Illinois 2031, Indiana 14990, Ohio 76890 : What was the whole number ? *Ans.* 875938.

69. In 1820, the population of the city of Glasgow amounted to 150000 persons, of whom the number professing the established Religion was 80319, Dissenters, including Episcopalians, 58633, and Roman Catholics 8245 : What was the number belonging to the three different sects ? *Ans.* 147197.

70. In the above year and place, there were 12 Established Churches and 8 Chapels in connexion with the Church, calculated to accommodate 24750 persons, and 42 Meeting-houses calculated to accommodate 33199 persons : What was the total number of persons who could be accommodated ? *Ans.* 57949.

71. The wise man, Solomon, had 1400 chariots, 12000 horsemen, 70000 men to bear burdens, 80000 to hew in the mountain, and 3600 to oversee them: What was the whole number of men? *Ans.* 165600.

72. In 1819, the number of schools of the Sunday and Adult School Union in Philadelphia, was 129, which contained 10550 white children, 377 white adults, 663 black children, and 716 coloured adults, who received instruction from 1431 teachers; the catalogue of the articles which had been printed for the Union, was 32000 premium books, 10000 copies of a Sunday-School Spelling-book, 6000 alphabetical cards, 3000 class papers, 500000 red and blue tickets, 10000 addresses to parents, 1000 internal regulations for Sunday and Adult Schools, and 1000 copies of the first annual report: What was the whole number of learners; and what was the whole number of the articles which had been printed?

Ans. { 12306 learners.
563000 the number of articles.

FEDERAL MONEY.

Q. What is Federal Money?

A. Federal Money is the coin of the United States, established by Congress, A. D. 1786.

Q. How are accounts by law to be reckoned?

A. By an act of Congress, all the accounts of the United States, the salaries of all officers, the revenues, &c. are to be reckoned in Federal Money.

Q. To what is Federal Money the nearest allied?

A. Federal Money is the nearest allied to whole numbers; and of all coins this is the most simple, and the operations in it, the most easy.

Q. How does Federal Money increase?

A. Federal Money increases in a tenfold ratio, like whole numbers, and the denominations are in a *decimal proportion*, thus,

10 mills, (*m.*) make	1 cent, marked	*c.*
10 cents,	1 dime,	*d.*
10 dimes,	1 dollar,	$
10 dollars,	1 eagle,	E.

ALSO,

10 mills,	1 cent.
100 cents,	1 dollar.

Q. What is the decimal expression of any sum in Federal Money?

A. It is simply the expression of a *mixed number* in decimal Fractions, *i. e.* dollars and decimal parts of a dollar; thus \$8,6=$8\frac{6}{10}$ dolls. \$15,94=$15\frac{94}{100}$ dolls.; or thus, 30 dollars, 7 dimes, 5 cents, 5 mills=$30\frac{755}{1000}$ dolls.

Q. What place must Dollars occupy?

A. Dollar being the *money unit*, must occupy the place of units.

Q. What are the less denominations, as dimes, cents, and mills?

A. The less denominations are decimal parts of a dollar, and may be distinguished from dollars by a separatrix [illegible]).

Q. What are the figures at the left hand of dollars called?

A. The figures at the left of dollars are called Eagles; and the first figure at the right hand of dollars, is dimes, the second, cents, and the third, mills.

Q. As ten dollars make one Eagle, what may the dollars in their different places be called?

A. The dollars in the ten's place, may be called units of eagles, those in the hundred's place, tens of eagles, &c. so that any sum in this money may be read differently either wholly in the lower denomination, or partly in the higher, and partly in the lower; thus \$75,25 may be read, either, 7525 cents, or 752 dimes and 5 cents, or 75 dollars and 25 cents, or 7 eagles, 5 dollars, 2 dimes, and 5 cents.

Q. What is shown by the following illustration?

A. It is shown that one eagle is equal to ten thousand mills, &c., thus,

E.	\$	*d.*	*c.*	*m.*
1=	10=	100=	1000=	10000
	1=	10=	100=	1000
		1=	10=	100
			1=	10

Q. What do eagles and dollars reckoned together express?

A. Eagles and dollars taken together express the number of dollars contained in the sum; also, dimes and cents, the number of cents; this expression is the usual mode of account, viz. to reckon the whole sum in dollars and cents, thus $125,75 cts.

Q. How many coins are there in the following table?

Eagles; or,					
Hunds.	Tens.	Dolls. or Units.	Dimes, or Tenth parts.	Cents, or Hund. parts.	Mills, or Thous. parts.
1	2	5,	7	5	5

A. There are four real coins and one imaginary coin; viz. the eagle, a gold coin, the dollar and the dime, silver coins, the cent, a copper coin, are real coins; the mill is only imaginary, there being no piece of money of that denomination; but half-eagles, half-dollars, double-dimes, half-dimes, and half-cents, are real coins.

Q. How does a cypher affect the value of figures?

A. A cypher, standing at the right hand of the figure or figures at the right of the separatrix, alters not its value; thus $7,7 is seven dollars and seven dimes; and if a cypher be annexed, thus, $7,70 it is still seven dollars and seven dimes; or which is the same thing, seven dollars and seventy cents. But a cypher placed before the seven, thus, $7,07, diminishes its value ten times by bringing it in the cent's place; it being then but seven dollars and seven cents.

Q. What must be done when the cents are less than ten?

A. When the cents are less than 10, put a cypher in the place of dimes; thus eight dollars and eight cents, is $8,08 cts.

The following are the weights of the coins of the United States.

	pwts.	*grs.*	
Eagles,	11	6	Standard Gold.
Half-Eagles,	5	15	
Quarter-Eagles,	2	19½	
Dollars,	17	8	Standard Silver.
Half-Dollars,	8	16	
Quarter-Dollars,	4	8	
Dimes,	1	17⅗	
Half-Dimes,	0	20⅘	
Cents,	8	16	Standard Copper.
Half-Cents,	4	8	

*Note.—The Standard for gold coin is 11 parts pure gold, and 1 part alloy; the alloy to consist of silver and copper. The Standard for silver coin is 1485 parts fine, to 179 parts alloy; the alloy to be wholly copper. A pound of pure gold is valued at 15 pounds of pure silver.

ADDITION OF FEDERAL MONEY.

RULE.

Q. How do you place the numbers to be added?

A. Place the numbers to be added according to their value; *i. e.* dollars under dollars, dimes under dimes, cents under cents, &c. and proceed exactly as in whole numbers.

Q. Where do you place the separatrix in the amount?

A. Place the separatrix directly under the separating points above.

PROOF.

Q. How is Addition of Federal Money proved?

A. To prove addition, subtraction, multiplication, and division of Federal Money and Decimal Fractions, proceed as in the rules of the same name in whole numbers, taking care to make the separatrix as the different rules direct.

EXAMPLES.

Note.—The method of proceeding in Addition of Federal Money illustrated.

1. Add together the following numbers.

	Eagles; or,					
	Hunds.	Tens.	Dollars, or Units.	Dimes, or Tenth parts.	Cents, or Hund. parts.	Mills, or Thous. parts.
	2	1	2,	1	0	1
		9	0,	5	4	0
	4	0	5,	4	7	5
	6	7	7,	9	6	4
		2	4,	4	7	0
1	4	1	0,	5	5	0

NOTE.—To find the *amount* of the numbers here given to be added, begin at the bottom of the column of mills, and say 0 is nothing, and 4 and 5 are 9, but 0 is nothing, and 1 is 10, which *amount* (10) being *mills*, and just *equal* to 1 cent, set down a 0 under the column of mills, and carry 1 for the *ten* to the 7 in the column of cents, and say 1 added to 7 is 8, and 6 are 14, and 7 are 21, and 4 are 25, but 0 is nothing, which *amount* (25) being *cents* is an *excess* of 5 over an *even* number of *tens;* therefore set down 5 under the column of cents and carry 2 for the *two tens* to the 4 in the column of dimes, and say 2 added to 4 are 6, and 9 are 15, and 4 are 19, and 5 are 24, and 1 is 25, which *amount* (25) being dimes, is an *excess* of 5; therefore set down 5 under the column of dimes, and carry 2 to the 4 in the column of dollars, and say 2 added to 4 are 6, and 7 are 13, and 5 are 18, but 0 is nothing, and 2 are 20, which *amount* (20) being *dollars*, is an *even* number of *tens;* therefore set down a 0 under the column of dollars, and carry 2 to the 2 in the first column of eagles, and say 2 added to 2 are 4, and 7 are 11, but 0 is nothing, and 9 are 20, and 1 is 21, which *amount* (21) being *eagles*, is an *excess* of 1, therefore set down 1 under the first column of eagles, and carry 2 to the 6 in the second column of eagles, and say 2 added to 6 are 8, and 4 are 12, and 2 are 14: this being the *last* column, set down the whole *amount* (14) placing the 4 directly under the column, and carrying the 1 and setting it in the next place, and the work is done.

2. Add together the following numbers in dollars, cents, and mills.

Operation.

$	c.	m.
475,	66	2
556,	55	1
47,	04	0
4,	40	5
967,	49	4

Note.—Begin and add up the column of mills, disposing of the *amount* as the rule directs; then add up the first column of cents, and so proceed with the second column of cents, and so on through all the columns of the dollars, disposing of the several *amounts* as the rule requires.—Thus the answer, or total amount, is found by the usual mode of account, to be two thousand and fifty-one dollars, fifteen cents, and two mills.

3.			4.		5.		6.		
$	c.	m.	$	c.	$	c.	$	c.	m.
10,	11	0	0,	85	295,	75	0,	10	5
15,	99	7	0,	75	7,	05	0,	01	5
674,	82	5	0,	25	0,	50	0,	09	
741,	01	4	0,	10	1,	00	0,	11	
297,	50	0	0,	20	0,	01	0,	70	
260,	55	4	0,	97	95,	99	1,	99	5

7. Add 6 dolls. 60 cts.+5 dolls. 25 cts.+32 dolls. 29 cts.+and 100 dolls. 10 cts. together. *Ans.* 144 dolls. 24 cts.

8. Add 90 dolls. 90 cts., 40 dolls. 40 cts., 8 dolls. 8 cts., and 2 dolls. 2 cts. together. *Ans.* 141 dolls. 40 cts.

9. Add 80 cts., 99 cts., 9 cts., 20 cts., 2 dolls. 2 cts., 11 cts., 59 cts., and 20 cts. together. *Ans.* $5.

10. Add 9 mills, 4 mills, 6 mills, 7 mills, 2 mills, 8 mills, 5 mills, 3 mills, 8 mills, 7 mills, and 1 mill together. *Ans.* Six cents.

11. Add together 205 dollars 50 cents, and 5 mills; 75 dollars 25 cents; 6 dollars 84 cents, 5 mills; and 959 dollars 7 cents. *Ans.* $1246,67 cts.

Note.—This ($) character placed either at the left hand, or directly over a sum, signifies all the figures to the left of the separatrix to be dollars, the first two to the right, cents, the third, mills, and all the rest, (if any,) parts of mills.

12. What is the amount of $957,29+$100,01+$0,97+$685,06+ and $705? *Ans.* $2448,33.

13. If you lend a friend, at different times, ten cents, fifty-five cents, ninety cents, seventy-five cents, twenty-five cents, one dollar five cents, and eighty cents, what is the whole amount lent? *Ans.* Four dollars, forty cents.

14. What is the amount of seven dimes, five dimes, and ninety cents? *Ans.* Two dollars, ten cents.

15. William purchased vest patterns at different prices, viz. one at seventy-five cents, one at ninety cents, one at one dollar seventy-five cents, two at two dollars twenty-five cents each, and six at one dollar ten cents each: What did they cost him? *Ans.* $14,50.

NOTE.—In the above sum, the prices of two of the vest patterns being the same, must be set down twice, and the prices of six of them being the same, must be set down six times, and then all of them added together.

16. Suppose you owe one man $900, another $45,75, a third $5055, a fourth $391,21, a fifth $0,10, and a sixth $400; how much do you owe them all?

Ans. $6792,06.

17. If John owe you $300,30, and Thomas $75,60, and Harry $750,50, and Peter three times as much as Harry; how much do they all owe you?

Ans. $3377,90.

18. The bill making appropriations for the support of the Navy of the U. States for the year 1819, included the following items, viz. for pay of officers and seamen $1270333,50; provisions $594047,50; medicines and all expenses of sick $36000; repairs of vessels $350000; contingent expenses $300000; repairs of navy yards, docks, &c. $100000; completing medals and swords $7508; pay and subsistence of marine corps $122898; clothing the same $2038,10; for military stores for do. $1087,50; contingent expenses $18600: What was the amount of the bill? *Ans.* $2802512,60.

19. The following are the different species of taxable property, and their different amounts, and taxes, at ten cents on the dollar, in Connecticut, for the year 1817, viz. the amount of the list of polls, was $1718490 which paid $17184.90; cattle, horses, and mules $1464597,26, do. $14645,97; lands, houses, and stores $1795882,79,

do. $17958,82 ; riding carriages $74628, do. $746,28 ; watches and clocks $159488, do. $1594,88 ; money at interest, bank stock, and plate $136423,22, do. $1364,23 ; assessments for faculties $229977,10, do. $2299,77 ; half four-folds $7873,18, do. $78,73 : What was the amount of the grand list, and the amount of all the taxes for the year 1817 ?

Ans. { $5587359,55 Amount of grand list.
$55873,58 Amount of taxes.

NOTE.—In the above sum, first find the amount of the grand list, and then the amount of the taxes.

20. The amount of disbursements on account of the public buildings at Washington, from the 1st of Oct. 1818, to the 30th of Sept. 1819, was as follows, viz. wings of the Capitol $181317,68 ; centre of do. $160925,75 ; executive offices $132149,67 ; offices to President's house $8498,63 : What was the total amount ?

Ans. $482891,73.

21. The expenses of the Legislature of N. York, for the year 1819, were as follows, viz. senate $22429,21 ; house of assembly $78944,46 ; contingencies $5430,79 : What was the amount of the expenses ?

Ans. $106804,46.

22. The nett revenue of the U. States arising from duties upon imports and tonnage, internal duties, direct tax, &c. during the year 1815, was as follows, viz. customs $36306022,51 ; internal duties $5963225,88 ; direct tax $5723152,25 ; public lands $1287959,28 ; postage and other incidental receipts $275282,84 : What was the amount of the whole ? *Ans.* $49555642,76.

23. The nett revenue of the U. States which accrued from duties upon imports and tonnage, internal duties, direct tax, public lands, postage, and other incidental receipts, during the years of 1815 to 1819 inclusive, was as follows, viz. for the year 1815, $49555642,76 ; 1816, $36657904,72 ; 1817, $24365227,34 ; 1818, $26095200, 65 ; 1819, $25827384,33 : What was the amount of the nett revenue for the whole five years ?

Ans. $162501359,80.

24. The exports from the U. States in the year ending Sept. 30th, 1819, were as follows, viz. produce of the Sea $2024000 ; of the Forest $4858000 ; of Agricul-

ture $41502000; Manufactures $2578000; Uncertain $630000: What was the whole amount?

Ans. $51592000.

25. The exports from the U. States, of the produce of the sea, in the year ending Sept. 30th, 1819, were as follows, viz. dried fish $1052000; pickled $409000; whale oil and bone $431000; spermaceti oil and candles $132000: What was the total amount?

Ans. $2024000.

26. The exports of the produce of the Forest as above, were as follows, viz. skins and furs $481000; ginseng $30000; lumber, staves, spars, shingles, hoops, poles, hewn timber, &c. $2406000; oak bark, and other dyes $146000; naval stores $376000; ashes, pot and pearl $1419000: What was the total amount?

Ans. $4858000.

27. The exports of the produce of Agriculture as above, were as follows, viz. beef, tallow, hides, live cattle $598000; butter and cheese $297000; pork, bacon, lard, and live hogs $1009000; horses and mules $100000; sheep $21000; wheat, flour, and bread $6415000; Indian-corn and meal $1424000; rye and meal $296000; rice $2143000; oats, pulse, potatoes, &c. $195000; tobacco $7687000; cotton $21082000; flax-seed $171000; hops $20000; wax $37000; poultry, maple sugar, &c. $7000: What was the total amount? *Ans.* $41502000.

28. The exports of the produce of Manufactures as above, were as follows, viz. tallow candles and soap $469000; boots, shoes, and sadlery $122000; hats $16000; grain spirits, beer, and starch $95000; furniture, coaches, and other carriages $325000; cordage $40000; iron $54000; snuff, wax candles, tobacco, lead, &c. $503000; spirits from molasses $153000; refined sugar $11000; chocolate $5000; gunpowder $110000; brass and copper $13000; medicinal drugs $32000; uncertain manufactured articles $301000; raw materials $329000: What was the total amount?

Ans. $2578000.

29. The demands on the Treasury of the State of Connecticut for the year ending March 31st, 1821, were estimated as follows, viz. 1st. *Ordinary expenses of government.* Salaries $9600; debentures of General As-

sembly, &c. $17400 ; contingent expenses $6300 ; judicial do. $12440 ; support of State paupers $8000 ; New-Gate Prison $8000 ; Quarter-Master-General Department $680 : 2d Allowance of $2 on $1000 to schools, on list of 1819 $8200 : 3d. Appropriations due to the Baptist denomination $7687 : 4th. Allowance due to schools on list of 1818 $960 : What was the amount of the demands ? *Ans.* $79267.

30. The estimates of the government expenses of the U. States for the year 1820, were as follows, viz. civil department $1099832,29 ; submissions for do. $18100 ; miscellaneous $971482,88 ; intercourse with foreign nations $333277,76 ;

Military establishment, *viz.* expenses of the army $3380614,96 ; permanent objects $3003971,04 ; military pensions $426845,03 ; revolutionary do. $3066400 ; half-pay pensions to widows and orphans $100000 ; Indian department $315000 ; naval establishment $2474507,50 ; marine corps $227521,26 : What was the whole amount ? *Ans.* $15417552,72.

31. In 1820, the extent of the whale-fishery of *New-Bedford*, *Nantucket*, and *Martha's Vineyard*, (three ports of Mass.) was as follows : There were round Cape Horn, or on their passages, 18 ships and 1 brig, (tonnage 5847) and whose outfits cost $465000, return cargoes estimated at $890000 ; from the *Vineyard*, there were two ships, cost $50000, their return cargoes would probably amount to $93000 ; from *Nantucket* 50 ships, which probably cost $1350000, their return cargoes would probably amount to $2342000 ; from *New-Bedford*, on this side Cape Horn, there were 11 ships and 8 brigs, which probably cost $277000, their return cargoes probably would amount to $363000 ; from *Nantucket*, 10 ships, which probably cost $140000, their return cargoes would probably amount to $227000 : What was the total amount of the cost and cargoes ? *Ans.* $6197000.

DECIMAL FRACTIONS.

Q. What are Decimal Fractions ?

A. Decimal Fractions are expressions of parts of an integer ; or, are in value something less than *one* of any thing, which is signified by them.

Q. What are the Terms in Decimal Fractions; and what do they show?

A. The Terms in Decimal Fractions are *Numerator* and *Denominator*. The Numerator is the upper number, and shows how many of those parts are signified by the fraction. The Denominator is the lower number, and shows into how many parts an integer is divided.

Q. What is a decimal fraction?

A. A decimal fraction is that whose denominator is an unit, with one or more cyphers annexed, thus, $\frac{2}{10}$, $\frac{4}{100}$, $\frac{54}{100}$, &c.

Q. How is the integer divided?

A. The integer, or number *one*, as 1 pound, 1 dollar, &c. is always divided either into 10, 100, 1000, &c. equal parts; consequently the denominator of the fraction will always be, either 10, 100, 1000, &c. which being understood, need not be expressed; for the true value of the fraction may be expressed by writing the numerator only, with the separatrix placed before it; thus, $\frac{5}{10}$ is written ,5; $\frac{75}{100}$ is ,75; $\frac{954}{1000}$ is ,954; &c.

Q. When the numerator has not so many places as the denominator has cyphers, how do you proceed?

A. Put so many cyphers at the left hand, as will make up the deficiency; thus, $\frac{5}{100}$ is written ,05; and $\frac{9}{1000}$ is ,009; &c.

Q. When integers and decimals are expressed together in the same sum, what is that sum called, and how is it expressed?

A. A mixed number; and is expressed thus, 75,25. The 75 are integers, and the 25 are decimals, which *last* are counted from the left towards the right hand; and each decimal figure takes its *value* by its distance from the unit's place: if it be in the first place after units, it signifies tenths; if in the second place, it signifies hundredths, &c. decreasing in each place in a tenfold proportion, as in the following Table.

NUMERATION TABLE.

Hundreds of Mill.	Tens of Millions.	Millions.	Hundreds of Thous.	Tens of Thous.	Thousands.	Hundreds.	Tens.	Units.	Tenth parts.	Hundredth parts.	Thousandth parts.	Tens of Thous. parts.	Hund. of Thous. parts.	Millionth parts.	Tens of Mill. parts.	Hund. of Mill. parts.
9	8	7	6	5	4	3	2	1,	2	3	4	5	6	7	8	9

Whole Numbers. Decimals.

Q. Do cyphers, placed at the right hand of decimals, alter their value?

A. Cyphers placed at the right hand of decimals do not alter their value, since every significant figure continues to possess the same place; thus ,5 ,50 ,500, &c. are all of the same value, and equal to ½.

Q. Do cyphers, placed at the left hand of decimals, alter their value?

A. Cyphers placed at the left hand of decimals *decrease* their value in a tenfold proportion, by removing them further from the separatrix; thus ,5 ,05 ,005, &c. are five tenth parts, five hundredth parts, five thousandth parts, &c.

Illustration.

,5	signifies 5 tenth parts.
,05	5 hundredth parts.
,25	25 hundredth parts.
,255	255 thousandth parts.
5,5	5 and 5 tenths.
5,005	5 and 5 thousandths.
,0001	1 ten thousandth.
,122	122 thousandths.
,1222	1222 ten thousandths.
,0122	122 ten thousandths.
,0012	12 ten thousandths.
1,0002	1 and 2 ten thousandths.

DECIMAL TABLE.

,1 tenth.	,01 hundredth.	,001 thousandth.	,11 hundredths.
,2	,02	,002	,12
,3	,03	,003	,13
,4	,04	,004	,14
,5	,05	,005	,15
,6	,06	,006	,16
,7	,07	,007	,17
,8	,08	,008	.18
,9	,09	,009	,19

,011 thous'dths.	,21 hundredths.	,021 thous'dths.	.101 thous.
,012	,22	,022	,102
,013	,23	,023	,103
,014	,24	,024	,104
,015	,25	,025	,105
,016	,26	,026	,106
,017	,27	,027	,107
,018	,28	,028	.108
,019	29	,029	,109

Note.—The above Table shows how a *Decimal* may either be increased or diminished and the Table enlarged at pleasure.

ADDITION OF DECIMALS.

RULE.

Q. What is the method of placing the numbers to be added?

A. Place them, whether mixed or pure decimals, under each other, according to the value of their places.

Q. How do you find their amount; and how do you point off the places for decimals?

A. The amount is found as in whole numbers; and so many places must be pointed off for decimals, as are equal to the greatest number of decimal places in any of the given numbers.

EXAMPLES.

Note.—The method of proceeding in Addition of Decimals illustrated.

1. What is the amount of 65,725 dolls., 945,05 dolls.,

,2579 of a dollar, and 200,027 dolls., when added together?

Thousands.	Hundreds.	Tens.	Units.	Tenth parts.	Hunds. parts.	Thous. parts.	Tens of T. parts.
		6	5,	7	2	5	
	9	4	5,	0	5		
			,	2	5	7	9
	2	0	0,	0	2	7	
1	2	1	1,	0	5	9	9

NOTE.—Arrange the whole numbers from the separatrix, towards the left hand, and the decimals, from the same point towards the right. Then to find the *amount* of the sum, begin with the column of ten thousandth parts, the *amount* of which is 9, and set it down underneath. Then add up the column of thousandth parts, and set the *excess* of *tens*, which is 9, underneath. Then carry 1, and add up the column of hundredth parts, and set the *excess*, which is 5, underneath. Then carry 1, and add up the column of tenth parts, which being an *even* number of *tens*, set a 0 underneath. Then carry 1, and add up the column of units in dollars, and set the *excess*, which is 1, underneath. Then carry 1, and add up the column of tens in dollars, and set the *excess*, which is 1, underneath. Then carry 1, and add up the column of hundreds in dolls.; set down its *amount*, and the work is done.—Thus the *answer* is 1211 dolls. and $\frac{0599}{10000}$ parts of a dollar, by which, is seen that *Decimals* and *Federal Money* are both subject to *one* and the *same* law of notation, and consequently of operation.

NOTE.—Dollar being the money unit, and a dime being the tenth, a cent the hundredth, and a mill the thousandth part of a dollar or unit, it is evident that any number of dollars, dimes, cents, and mills, is simply the expression of dollars and decimal parts of a dollar: Thus, 9 dollars, 7 dimes, 5 cents=9,75 dolls. &c.

2. Find the amount of 4,625+1,397+6709,2+,47029 + and 100,101. *Ans.* 6815,79329.

3. Find the amount of 2,4567+,8064+,91027+,00126 +,00009+ and ,82528. *Ans.* Five.

4. Find the amount of ,12346+,21397+,00461+ ,02007+,000096+ and ,437794. *Ans.* ,8.

5. Find the amount of ,002134+,000246+,012405+ ,009078+,000862+ and ,075275. *Ans.* One tenth.

6. Find the amount of ,22222+,11111+,33333+,44444+,55555+ and 7,22223. *Ans.* 8,88888.

7. Add ,002145+,001237+,000307+,004009+,0009 + and ,001764 together. *Ans.* ,010362.

8. Add four tenths, nine tenths, twelve hundredths, twenty-six hundredths, thirteen thousandths, thirty-seven thousandths, and ninety-nine hundredths together.
Ans. 2,720=2,72.

9. Add the following parts of an acre together, viz. ,2449+,4715+,7635+ and ,0201.
Ans. 1,5000=1,5 acre.

10. Add the following yards and parts of a yard together, viz. 56,4329+947,+71,17459+1,00054+ and ,94102. *Ans.* 1076,54905 yards.

11. What is the amount of $75,64575+$9,812+$4,54 +$30,+$0,015+ and $1,242 ? *Ans.* $121,25475.

12. What is the amount of seven hundred sixty-nine and nine tenths; forty-five and one hundred thirty-three thousandths; and eighteen hundredths ? *Ans.* 815,213.

13. Add 1,999999 and one millionth part of an unit together. *Ans.* Two.

14. Add eight hundredths, forty-five thousandths, ninety-nine, and sixty-six hundredths together.
Ans. 99,785.

15. Add ,8946+,3547+,9853+ and ,7654 together.
Ans. Three.

16. Suppose a ship just returned from the Indies to be worth $9476,965, and one sixth part of her cargo to be valued at $45766,488 : What is the value of the ship and cargo ? *Ans.* $284075,893.

NOTE.—In the above sum, as the value of only one sixth part of the cargo is given, it must be set down six times, and added to the worth of the vessel, to find the whole value.

SIMPLE SUBTRACTION.

Q. What does Simple Subtraction teach ?

A. Simple Subtraction teaches to take a less number from a greater of the same kind, to find their difference; as 6 taken from 9, the difference is 3.

Q. What are the Terms in Simple Subtraction; and how are they known?

A. The Terms in Simple Subtraction are *Minuend*, *Subtrahend* and *Remainder;* and are known by the Minuend being the greater number, the Subtrahend the less number, and the Remainder, the number left after subtracting.

RULE.

Q. How do you write down numbers to be subtracted?

A. To write down numbers to be subtracted, place the subtrahend under the minuend, units under units, tens under tens, &c. and draw a line underneath.

Q. Where and how do you begin to subtract a sum?

A. In subtraction begin with the unit figure in the subtrahend and subtract it from the minuend, setting down the remainder; and so on, if the lower figure do not exceed the upper one.

Q. How do you proceed, if the lower figure be greater than the upper one?

A. Suppose *ten* to be added to the upper figure, and subtract the lower figure from that sum thus added, and place the remainder under the figure subtracted; then *carry one* and add it to the next figure in the subtrahend for the *ten* which were borrowed; and thus proceed through the whole.

PROOF.

Q. How is Simple Subtraction proved?

A. To prove Simple Subtraction, add the remainder and subtrahend together, which *amount*, if the work be right, will be equal to the minuend.

NOTE.

Q. What is the reason of *borrowing ten?*

A. The reason of borrowing ten is, when two numbers are equally increased by adding the same to both, their differences will be equal. Thus the difference between 2 and 6 is 4; add the number 10 to each of these figures (2 and 6) and they become 12 and 16, still the difference is 4. In proceeding as above directed, we add or suppose to be added 10 to the *minuend*, and we likewise add 1 to the next higher place of the *subtrahend*, which is just equal in value to 10 of the lower place.

Q. Of what use is Subtraction?

A. The use of Subtraction is to find the *exact difference* between two or more numbers.

SUBTRACTION TABLE.

Q. How is the following Subtraction Table to be read?

A. Begin at the middle figure, and read thus; 2 from 2 leaves 0; 2 from 3 leaves 1; 2 from 4 leaves 2, &c.

2—2=	0	7—3=	4	5—5=	0	7—7=	0
3	1	8	5	6	1	8	1
4	2	9	6	7	2	9	2
5	3	10	7	8	3	10	3
6	4	11	8	9	4	11	4
7	5	12	9	10	5	12	5
8	6	4—4=	0	11	6	8—8=	0
9	7	5	1	12	7	9	1
10	8	6	2	6—6=	0	10	2
11	9	7	3	7	1	11	3
12	10	8	4	8	2	12	4
3—3=	0	9	5	9	3	9—9=	0
4	1	10	6	10	4	10	1
5	2	11	7	11	5	11	2
6	3	12	8	12	6	12	3

EXAMPLES.

NOTE.—The method of proceeding in Simple Subtraction illustrated.

1. What is the difference between 9745 dollars and 5362 dollars?

NOTE.—Here are two numbers given for exercises in subtraction; each of them contains *units*, *tens*, *hundreds*, and *thousands*. To prepare them for the operation of subtraction, is to write the subtrahend under the minuend, units under units, tens under tens, &c. as in the following manner.

	Thousands.	Hundreds.	Tens.	Units.	
Minuend,	9	7	4	5	dollars.
Subtrahend,	5	3	6	2	dollars.
Remainder,	4	3	8	3	Difference, or answer.
	9	7	4	5	Proof.

Note.—To find the answer or difference of the numbers here given to be subtracted, begin with the unit figure in the subtrahend, and say 2 from 5 leaves 3, which (3) set down directly under the column subtracted. Proceed to the next column, and say 6 from 4, I cannot, therefore suppose 10 to be added to the upper figure (4) which makes 14, and say 6 from 14 leaves 8, which (8) set down; then carry 1 for the *ten* which were borrowed, and add it to the 3 in the next column, and say, 4 from 7 leaves 3, which (3) set down; proceed to the next column, and say 5 from 9 leaves 4, which (4) set down, and the work is done.

To prove the sum, add the remainder and subtrahend together, and when the lower figure exceeds the upper one, borrow 10, and carry 1 as before.

Q. What is the difference between 2002 pounds and 1022 pounds ?

	Thousands.	Hundreds.	Tens.	Units.	
Minuend,	2	0	0	2	pounds.
Subtrahend,	1	0	2	2	pounds.
Remainder,		9	8	0	Ans.
					Proof.

Note.—To subtract this sum, begin with the unit column, and say 2 from 2 leaves 0, which (0) set down; proceed to the next column, and say 2 from 0 I cannot, therefore borrow 10, and say 2 from 10 leaves 8, which (8) set down; then carry 1 for the 10 which were borrowed, and add it to the 0 in the next column, and say 1 from 0 I cannot, therefore borrow 10, and say 1 from 10 leaves 9, which (9) set down; then carry 1 as before, and add it to the 1 in the next column, and say 2 from 2 leaves 0, which (0,) as this is the last column, must not be set down, but omitted; then, the difference being 980 pounds, the work is done.

	3.	4.	5.
Minuend,	3 3 3 3 3	4 4 4 4 4	5 5 5 5 5
Subtrahend,	2 2 2 2 2	3 3 3 3 3	6 6 6 6
Remainder,			
Proof,			

	6.	7.	8.
		Dollars.	*Pounds.*
From	77777	111111	610903
Take	70007	5441	561728
Remainder,	[illegible]		
Proof,			

	9.	10.	11.
	Yards.	*Gallons.*	*Miles.*
From	908190	100001	11110001
Take	777777	99999	11011019
Rem.			
Proof,			

	12.	13.	14.
	Eagles.	*Bushels.*	*Days.*
From	100000	794615	5000000
Take	9999	600010	4597123
Rem.			
Proof,			

15. From 999444 take 444999. *Ans.* 554445.
16. From 884466, take 773355. *Ans.* 111111.
17. From 110077—10099. *Ans.* 99978.

NOTE.—This mark (—) signifies that the less number must be subtracted from the larger.

18. From 10000—1. *Ans.* 9999.
19. From 10000—9999. *Ans.* 1.
20. From 100000—10000. *Ans.* 90000.
21. From 2000197—1000009. *Ans.* 1000188.
22. From 6450917—6440971. *Ans.* 9946.
23. From 9 millions, subtract one. *Ans.* 8999999.
24. What number added to 4+6 is equal to 24—8 ? *Ans.* 6.

NOTE.—In the above sum, subtract the amount of 4 and 6 from the difference between 24 and 8; also pursue the same principle in the succeeding sum.

25. What number added to 333+666=9999—8888? *Ans.* 112.

26. Two numbers being given, whose difference is 382, and the greater number 97846: What is the less number? *Ans.* 97464.

27. The greater of two numbers is 67081, and the less 20989: What is the difference? *Ans.* 46092.

28. From 777 millions, take 777 thousand. *Ans.* 776223000.

29. What number added to one thousand and nineteen, will make eighteen hundred and twenty? *Ans.* 801.

30. From one thousand and fifty-two, subtract two hundred and ninety-seven. *Ans.* 755.

31. From nine hundred twenty-five thousand, one hundred and sixty-six, take seventy-five thousand, three hundred and twenty-four. *Ans.* 849842.

32. Subtract nine hundred and ninety-nine thousand, from nine millions.

Ans. Eight millions and one thousand.

33. What number is that, which being taken from 9756745, will leave 1949709? *Ans.* 7807036.

34. The Sun's diameter is 883000 miles, and the Earth's diameter 7964 miles: What is the difference of their diameters? *Ans.* 875036 miles.

35. Suppose you borrow 2222 dollars, and afterwards pay 1101 dollars: How much remains unpaid? *Ans.* 1121 dollars.

36. A lent B $1044 for 30 days, at the expiration of which, B paid A $940: How much was still due from B to A? *Ans.* $104.

NOTE.—In several following sums, the learner will bear in mind, that the distance of time from the occurrence of one thing to that of another, can be known by subtracting the date of the thing first happening, from that of the last; and the distance of time since any remarkable event can be known by subtracting the date thereof from the present year.

37. George Washington was born in the year 1732, and died in 1799: How old was he when he died? *Ans.* 67 years.

38. In Mexico, two millions of people died by the pes-

tilence, A.D. 1584: How many years from that time to A.D. 1820? *Ans.* 236.

39. How long was it from the discovery of America by Columbus in 1492, to the declaration of the American Independence in 1776? *Ans.* 284 years.

40. The first Chaise seen in New-Haven was in 1740: How many years is it from that to the present time? *Ans.*

*41. I was born in 1791: What is my age now? *Ans.*

42. William was 75 years of age in 1820: I demand in what year he was born? *Ans.* In 1745.

43. I demand the difference between three times 31, and five times 19? *Ans.* Two.

44. What number is that, to which if you add nine times 6 it will become 100? *Ans.* 46.

45. What number is that, which taken from twice 39 leaves 47? *Ans.* 31.

46. The first Newspaper printed in Boston was in April 1704: How many years have elapsed since? *Ans.*

47. The British Foreign Bible Society issued during the year ending March 31st 1819, 123247 Bibles and 136784 Testaments: How many more Testaments than Bibles did the Society issue? *Ans.* 13537.

48. The number of votes given in the district of Maine, in favour of separation, was 17091, and against it, 7132: Of how many votes did the majority consist? *Ans.* 9959.

49. Within one year preceding Dec. 15th, 1818, in London, Middlesex, and Surry, and in the city and liberties of Westminster, there were 24333 persons christened, and 19705 buried: How many more were christened than buried? *Ans.* 4628.

50. Chimborazo, a mountain in South America, is 20900 feet, and the mountains of Thibet, in Asia, 26862 feet above the level of the sea: What is their difference in height? *Ans.* 5962 feet.

51. The number of deaths in the city of New-York during the year 1818, was 3265; it being 738 more than in the preceding year: I demand the number of deaths in 1817? *Ans.* 2527.

52. In 1790, there were 75 Post-Offices in the United States, and the amount received for postage was $37935; in 1815 there were 3000 Post-Offices, and the amount of postage received that year was $1043065: What was the increased number of Post-Offices; also the increased amount of postage?

Ans. { 2925 Post-Offices.
$1005130 amount.

Note.—In the above sum, first find the increased number of post-offices for the 25 years; and then the increased amount of postage for the same time.

53. From 1793 to 1816, the yearly transportation of the mails had increased from 843608 to 7568224 miles; and from 1789 to 1816, the number of miles of post-road had been increased from 1875 to 51600 miles: What were the yearly increased transportation of the mails; and the increased distance of post-roads from the year 1789 to 1816?

Ans. { 6724616 miles, yr. incr. transp. of the mails.
49725 miles, incr. dist. of post-roads.

Note.—In the above sum, first find the amount of the yearly increased transportation of the mails; and then find the amount of the increased distance of post-roads for the 27 years.

54. Six thousand persons have been vaccinated in Constantinople, and 12048 persons have been vaccinated by the Philadelphia Vaccine Society: How many more persons were vaccinated by the Vaccine Society, (Phil.) than were vaccinated at Constantinople? *Ans.* 6048.

55. The bankrupts in London for half of the year 1817, were 1008; and for the same period in 1818, there were only 552: What was the difference? *Ans.* 456.

56. In 1818, 22434 children were instructed in Sunday-Schools in the city of Manchester, (Eng.) and 550000 in the United Kingdom: How many more were instructed in the United Kingdom, than in Manchester?

Ans. 527566.

57. The four quarters of the globe are divided into four great religious classes, viz. Christians 175 millions, Jews 9 millions, Mahometans 160 millions, and Pagans 656 millions: How many more Christians are there than Jews, and how many more Pagans are there than Mahometans?

Ans. 166 mills. of Christians more than Jews, and 496 mills. of Pagans more than Mahometans.

58. The number of deaths in Baltimore in 1819, was 2287, and in New-York 3176, the latter being 89 less than in the preceding year; in Boston the number was 1070: How much did the number of deaths in New-York exceed those in Baltimore, and those in Baltimore exceed those in Boston in 1819; also, how many deaths were there in New-York in 1818?

Ans. The deaths in New-York exceeded those in Baltimore by 889; those in Baltimore exceeded those in Boston by 1217; and there were 3265 deaths in New-York in 1818.

NOTE.—In the above sum, first find the number of deaths in New-York exceeding those in Baltimore; and then those in Baltimore exceeding those in Boston; lastly, find the number of deaths in New-York in 1818.

59. During the celebrated siege that Gibraltar sustained, there were 8000 pounds of powder expended, and the enemy fired at the rock 258000 rounds, which was 53000 rounds more than were fired from the rock: How many rounds were fired from the rock?

Ans. 205000.

60. The fourth anniversary of the American Bible Society was celebrated in New-York May 11th, 1820; and from the establishment of the Society to the above date, there were printed at its depository and by its instrumentality, or otherwise obtained for distribution, 173752 Bibles and Testaments; and during the last mentioned year, there were issued from the depository 41192 Bibles and Testaments, of which, 18637 were gratuitously disposed of: How many were there of the last mentioned year not gratuitously disposed of? *Ans.* 22555.

61. In 1818, there were in the city of Quebec 11991 Catholics and 3246 Protestants: How many more Catholics were there than Protestants? *Ans.* 8745.

62. The Island of Cuba is 700 miles in length and 70 in breadth, containing 350000 souls; its port, Havana, is one of the finest in the world, capable of containing a thousand ships at once, and so narrow at the entrance, that not more than one can enter at a time; the city contains 25000 souls: How much do the inhabitants of the Island exceed those of the city in number?

Ans. 325000.

63. The number of votes given in favour of ratifying the Constitution of the State of Connecticut in 1818, was 13918, and against it 12364: Of how many votes did the majority consist? *Ans.* 1554.

64. In 1819, the number of baptisms (registered) in the city of Glasgow, was 2796, marriages 1456, and burials 3211: How much did the number of burials exceed that of baptisms; and how much did the latter exceed that of marriages?

Ans. { 415 burials exceeding baptisms.
1340 baptisms do. marriages.

65. King George III. reigned from 1760 to 1820; how long did he reign? *Ans.* 60 years.

66. In Hindostan there are 250000000 souls; one hundred millions are Pagans, who have the Shaster for their guide; and 50000000 are devoted followers of Mahomet, who have the Koran for their guide: How much does the number of Pagans exceed the followers of Mahomet? *Ans.* Fifty millions.

Questions and Exercises in Addition and Subtraction.

1. In 1749, the U. States contained 1046000 inhabitants; in 1771, 2000000; in 1790, 3929326; in 1800, 5309750; and in 1810, 7238903: What was the increased number of inhabitants in the above intermediate spaces of time? *Ans.* 6192903.

2. What number subtracted from 7031—812=218+462? *Ans.* 5539.

NOTE.—In the above sum, subtract the amount of 218 and 462 from the difference between 7031 and 812.

3. The number of convicts in the state prison (Mass.) on the 30th of Sept. 1818, was as follows, viz. 43 weavers, 13 screw-makers, 4 nailors, 30 shoe-makers, 12 brush-makers, 7 smiths, 8 founders, 5 tin-workers, 7 cabinet-makers, 32 inside labourers for the prison, 5 coopers, 83 stone-cutters, 23 oakum-pickers, 39 labourers, 10 in solitary confinement, and 23 sick: How many more were there, the total number being 363? *Ans.* 19.

4. For 200 guineas Mr. Howard at Haresford, who walked over a two mile piece of ground; on the first six days, walked the distance of 390 miles, on the seventh day 56 miles, on the eighth 57 miles, on the ninth 52 miles,

and on the tenth 45 miles: How many miles did he travel in the whole; and how many miles more did he travel on the first six days, than he did on the four last?

Ans. { 600 miles in the whole.
180 miles most in the first six days.

5. The import of cotton into England for the year ending Sept. 30th, 1818, from America, was 195650 bales; from Brazil 126818 do, from E. Indies 157630 do. from W. Indies 3959 do. The imports from Brazil and E. Indies during the previous year, were from the former place 64850 bales, and from the latter 72830 do.: What was the import of cotton into England for the year 1818; and what was the difference of imports between the same year and the year previous, from Brazil and E. Indies?

Ans. { 484057 bales imported in 1818.
146768 bales difference in the two years.

NOTE.—In the preceding sum, after finding the amount of cotton imported in 1818, find the difference of cotton imported from Brazil and E. Indies by subtracting the amount imported during the same year from the amount imported during the preceding year.

6. George Washington was President of the U. States from 1789, to 1797; his successor John Adams do. from that time to 1801; Thomas Jefferson do. from thence to 1809; James Madison do. from thence to 1817, and James Monroe from thence to 1821: How many years were they, one after another, President of the U. States?

Ans. 32 years.

7. Within one year preceding Dec. 15th, 1818, there were christened in the 97 parishes within the walls of London, 1048 persons, and in the 17 parishes without the walls, were christened 5317 persons; and there were buried within the walls, 1204, and without the walls, 4078: How many more were christened than buried both within and without the walls? *Ans.* 1083.

8. The British and Foreign Bible Society issued from March 31st, 1818, to the same period in 1819, 123247 Bibles and 136784 Testaments, being an increase of the preceding year of 65930 Bibles and Testaments: How many did the Society issue the preceding year?

Ans. 194101.

9. During the five years prior to 1820, the number of persons transported from Glasgow to New South Wales,

was as follows, viz. 20 for life, 57 for 14 years, and 64 for 7 years: How much did the number transported for stated terms of time, exceed that number transported for life? *Ans.* 101.

10. How many days added to 24+18=49—6? *Ans.* One day.

11. The English Methodist Conference had, in 1821, 107 missionary stations to provide for; 16 in Europe, 17 in Asia, 7 in Africa, and 67 in the West Indies and British dominions in North America, which were supplied by more than 150 Missionaries: How many more stations were there in the two latter places, than in the two former? *Ans.* 41.

SUBTRACTION OF FEDERAL MONEY.

RULE.

Q. How do you place the numbers to be subtracted?

A. Place the numbers according to their value; *i. e.* dollars under dollars, cents under cents, &c. and proceed exactly as in whole numbers.

Q. Where do you place the separatrix in the difference?

A. Place the separatrix directly under the separating points in the subtrahend and minuend.

EXAMPLES.

NOTE.—The method of proceeding in Subtraction of Federal Money illustrated.

1. What is the difference between $75,465 and $44,975?

	$	*c.*	*m.*	
Minuend	7 5,	4 6	5	
Subtrahend	4 4,	9 7	5	
Remainder	3 0,	4 9	0	Ans.
				Proof.

NOTE.—To find the difference of the numbers here given to be subtracted, begin with the mills in the subtrahend, and say 5 from

5 leaves 0, which (0) set down directly under the column subtracted. Proceed to the 1st column of cents, and say, 7 from 6 I cannot, therefore suppose 10 to be added to the upper figure (6) which make 16, and say, 7 from 16 leaves 9, which (9) set down; then carry 1 for the *ten* which were borrowed, and add it to the 9 in the 2d column of cents, and say, 10 from 4 I cannot, therefore suppose 10 to be added to the upper figure (4) which makes 14, and say, 10 from 14 leaves 4, which (4) set down; then carry 1 for the *ten* which were borrowed, and add it to the 4 in the unit column of dollars, and say, 5 from 5 leaves 0, which (0) set down; lastly, say 4 from 7 leaves 3, which set down, and the Answer is $30,49.

2. From $979,69 take $149,81. *Ans.* $829,88.
3. From $81,64 take $76,07. *Ans.* $5,57.
4. From $210,89—$199,99. *Ans.* $10,90.
5. From $50—$49,999. *Ans.* $0,001.
6. From $473 subtract $41,971. *Ans.* $431,029.
7. From $611—$600,019. *Ans.* $10,981.
8. From $400—$0,04. *Ans.* $399,96.
9. From $13—$0,08. *Ans.* $12,92.
10. From $1—$0,001. *Ans.* $0,999.
11. From $1—$0,10. *Ans* $0,90.
12. From $1111,111 deduct $999,999. *Ans.* $111,112.

13. Subtract one thousand dollars and ninety-five cents, from two thousand one hundred and two dollars. *Ans.* $1101,05.

14. Subtract nine dimes, from forty dollars. *Ans.* $39,10.

NOTE.—In placing the numbers in the above sum, call the nine dimes *ninety* cents.

15. From one dollar, take one dime. *Ans.* Ninety cents.

16. From ten dollars, take ten cents. *Ans.* Nine dollars, ninety cents.

17. From five dimes, take five mills. *Ans.* $0,495.

18. From one hundred dollars, subtract one mill. *Ans.* $99,999.

19. Harry went a journey, and before setting out, he had $75,10, and after accomplishing it, he had $5,06 left: How much did he expend in performing the journey? *Ans.* $70,04.

20. Suppose you give your obligation to A of $684,50, and afterwards you make a payment to A on said obliga-

tion of $597,05: How much is there still due from you to A on said obligation? *Ans.* $87,45.

21. The British and Foreign Bible Society received (in 1818) in subscriptions and donations $331953,33, and paid for Bibles, &c. to be distributed $236996,66; How much more did the Society receive than impart? *Ans.* $94956,67.

22. The expenses of the state prison in Massachusetts for the year 1818, were $55132,09, and the receipts were $41424,54: How much did the expenses exceed the receipts? *Ans.* $13707,55.

23. In 1818, a statement of forty banks in Pennsylvania gave the following results, viz. Debts $24849457,44; Credits $24957242,08: What was the difference between debts and credits? *Ans.* $107784,64.

24. The revenue arising from the Island of Cuba in 1818, amounted to $4104666, and in the preceding year to $3210195: What was the difference? *Ans.* $894471.

25. In 1818, the whole amount of notes issued by the U. States bank and its branches, had been $19854881, and the amount of notes then on hand at the bank and its branches, was $11184189: What was the amount of notes in circulation? *Ans.* $8670692.

26. The national expenditure of France for 1818, was $213490000, and the revenue $204610000: What was the difference between the expenditure and revenue? *Ans.* $8880000.

27. In 1819, the funds for carrying on the Grand Canal, in the State of New-York, were $619746,46; and payments in do. $626471,10: What was the difference? *Ans.* $6724,64.

28. The amount of taxes in the state of Ohio, charged on lands of non-resident proprietors, including the arrears due thereon for prior years, and sent out for collection for the year 1819, was $68512; and the amount of taxes charged on lands of resident proprietors for 1819, was $110964: What was the difference of the two amounts? *Ans.* $42452.

29. The amount of the grand list in Connecticut for the year 1817, was $5587389,55, and the amount of all the taxes $55873,53: What was their difference? *Ans.* $5531516,02.

30. How many dollars added to $8+$14=$36—$12? *Ans.* $2.

31. How many dollars subtracted from $141—$8=$36+12? *Ans.* $85.

Exercises in Addition and Subtraction of Federal Money.

1. How many dollars added to $8+$14=$36—$12? *Ans.* $2.

2. A and B receive a sum of money, of which A receives $763, and B three times as much, lacking $4,09: How much does B receive? *Ans.* $2284,91.

NOTE.—In the above sum, set down A's share three times, and add them together, which make three times as much as A's share: then subtract four dollars nine cents from their amount, and it gives B's share.

3. In 1819, it was stated that there were, in the State of Ohio, 21 banks; and that there were in the bank of Cincinnati $21701 in specie, and $230696 in notes in circulation; in the Farmer's bank $1969 do. and $20398 do.; in the Columbiana bank $5396 do. and $34285 do.: How much did the amount of notes in circulation exceed the amount of specie in those three banks? *Ans.* $256313.

NOTE.—In the above sum, subtract the amount of specie from the amount of notes.

4. The dividends of public school monies in Connecticut, made on the list of 1817, and the State tax of one cent on the dollar laid on the same list, were as follows, viz. Hartford county $12113,52 school monies, and $7924,19 State tax; N. Haven do. $9850,84 S. monies, and $6728,70 S. tax; N. London do. $8218,21 S. monies, and $5669,22 S. tax; Fairfield do. $11184,12 S. monies, and $7908,16 S. tax; Windham do. $8607,40 S. monies, and $5938,14 S. tax; Litchfield do. $11152,02 S. monies, and $7714,18 S. tax; Middlesex do. $5592,84 S. monies, and $3647,70 S. tax; Tolland do. $4195,19 S. monies, and $2832,05 S. tax: How much did the school monies exceed the State tax? *Ans.* $22551,80.

5. The amount of revenue which accrued from the customs of the U. States, from the commencement of the present government, to the end of the year 1819, was estimated at $351329799,53: How much would it leave

by deducting out $1037355,64 which was lost, and $540969,20 which was doubtful ? *Ans.* $349751474,69.

6. The exports from the U. States in the year ending Sept. 30th, 1819, were as follows, viz. Produce of the Sea $2024000 ; of the Forest $4927000 ; of Agriculture $41452000 ; Manufactures $2574000 : What was the difference between the produce of the Sea and the Forest ; also between Agriculture and Manufactures ?

Ans. { $2903000 diff. between the two former.
$38878000 diff. between the two latter.

7. The yeas and nays on the question taken in Congress, whether the capture of Pensacola, &c. was a violation of the Constitution of the U. States, were as follows, viz. yeas 69 ; nays 100 ; absent 16 : How much did the number of nays exceed that of yeas ; and how much did it exceed the amount of both yeas and those absent ?

Ans. { 31 nays exceeding the yeas.
15 nays exceeding the yeas and those absent.

SUBTRACTION OF DECIMALS.

RULE.

Q. What is the method of placing the numbers to be subtracted ?

A. In subtracting decimals, place them, whether mixed or pure decimals, under each other, according to the value of their places.

Q. How do you find their difference ; and how do you point off the places for decimals ?

A. The difference is found as in whole numbers ; and the places pointed off as in Subtraction of Federal Money.

EXAMPLES.

NOTE.—The method of proceeding in Subtraction of Decimals illustrated.

1. What is the difference between 6,564 pounds and 4,955 pounds ?

	Units.	Tenth parts.	Hund. parts.	Thous. parts.	
Minuend,	6,	5	6	4	pounds.
Subtrahend,	4,	9	5	5	pounds.
Remainder,	1,	6	0	9	Ans.
					Proof.

NOTE.—To find the difference of the numbers here given to be subtracted, begin with the thousandth parts in the subtrahend, and say, 5 from 4 I cannot, therefore suppose 10 to be added to the upper figure (4) which makes 14, and say, 5 from 14 leaves 9, which (9) set down; then carry 1 for the *ten* which were borrowed, and add it to the 5 in the column of hundredth parts, and say, 6 from 6 leaves 0, which (0) set down; then proceed to the column of tenth parts, and say, 9 from 5 I cannot, therefore suppose 10 to be added to the upper figure (5) which makes 15, and say, 9 from 15 leaves 6, which (6) set down; then carry 1 for the *ten* which were borrowed, and add it to the 4 in the column of units, and say, 5 from 6 leaves 1, which (1) set down, and the answer is 1,609 pounds.

2. From 29,342 take 21,504. *Ans.* 7,838.
3. From 17,94—1,9701. *Ans.* 15,9699.
4. From 67,4205—14,7019025. *Ans.* 52,7185975.
5. From 6742,05—147,019025. *Ans.* 6595,030975.
6. From ,00075—,00009. *Ans.* ,00066.
7. From 25,76471 yards subtract 21,9009 yards. *Ans.* 3,86381.
8. From $504 take $0,76401. *Ans.* $503,23599.
9. From ,7964—,749601. *Ans.* ,046799.
10. From 102—,00002. *Ans.* 101,99998.
11. From one hundred take one hundredth part of one. *Ans.* 99,99.
12. From 10 take one millionth part of it. *Ans.* 9,999999.
13. What is the difference between 314,0045 and 291,6091. *Ans.* 22,3954.
14. From three take ,970806. *Ans.* 2,029194.
15. From ,000018 take ,000009. *Ans.* ,000009.
16. From ,0851500—,0707056. *Ans.* ,0144444.

m4

17. From six hundred twenty-five thousandths take ninety-nine thousandths. *Ans.* ,526.

18. From nine thousandths take nine hundred thousandths. *Ans.* ,00891.

19. From nine thousandths take nine ten thousandths. *Ans.* ,0081.

20. From nine thousandths take nine millionths. *Ans.* ,008991.

21. From sixty millionths take forty-eight millionths. *Ans.* ,0000012.

22. From six hundred sixty-six thousand six hundred and sixty-six millionths, take two hundred twenty thousand two hundred and two millionths. *Ans.* ,446464.

23. From 240,75 feet, take 239,25 feet. *Ans.* 1,50=1,5 feet.

24. From 94,0627 acres, take 70,4568 acres. *Ans.* 23,6059 acres.

25. From 44 dollars, take 29 cents. *Ans.* $43,71.

26. The equatorial diameter of the earth is 7964 miles, and the polar diameter 7933,9999 miles: What is the difference of their diameters? *Ans.* 30,0001 miles.

27. The circumference of Lake Superior is 1500,0001 miles, and an Island in the Lake is 100,0009 miles in length: What is the difference between the circumference of the Lake and the length of the Island? *Ans.* 1399,9992 miles.

28. If the internal duties of the U. States on Carriages be $214639,735, and the duties on sales at Auction $53695,3875: What is their difference? *Ans.* $160944,3475.

29. Lake Erie is 564,85 feet higher than the river Hudson, and 145,5 feet higher than Rome: How much higher is Rome than the river Hudson? *Ans.* 419,35 feet.

SIMPLE MULTIPLICATION.

Q. What is Simple Multiplication?

A. Simple Multiplication is the multiplying any two numbers together without regard to their signification; as 8 multiplied by 4 makes the product equal to 32.

Q. What does it teach?

A. Multip[illegible]tion [illegible]ches to increase the greater of two numbers [illegible]en, a[illegible]ften as there are units in the less number.

Q. What ar[illegible]e Terms in Simple Multiplication; and how are they k[illegible]wn?

A. The Terms in Multiplication are *Multiplicand*, *Multiplier*, *Product*, and *Factors;* and are known by the Multiplicand being the number to be multiplied; the Multiplier, the number to multiply by; the Product, the result of the work; and the Factors, both the Multiplicand and Multiplier.

CASE I.

RULE.

Q. When the Multiplier does not exceed twelve, how do you write down numbers to be multiplied?

A. Place the multiplier under the multiplicand, units under units, tens under tens, &c. and draw a line underneath.

Q. Where and how do you begin to multiply a sum?

A. Begin to multiply with the *unit* figure in the multiplicand, and multiply it by the multiplier.

Q. How do you proceed, if the *product* of the unit column be less than ten?

A. If the product of the unit figure be less than ten, write it underneath the unit column; but if it be *ten*, or an *exact number* of tens, *write a cypher*, and *carry one* for *every ten* contained in the product: then, after multiplying the next figure of the multiplicand, add the *one carried*, to the product.

Q. If the product *exceed* ten, or any exact number of tens, how is it to be set down?

A. If the product exceed ten, write the *excess* above tens, *i. e.* set down the *right hand figure* of the *product,* and *carry* the *left hand figure* (or figures) to the *product* of the next figure of the multiplicand; add it thereto, which is *carrying one* for *every ten* contained in the *product* of the unit column; and so proceed with each figure in the multiplicand except the last, the whole product of which last figure must be set down.

PROOF.

Q. How is Simple Multiplication proved?

A. To prove Multiplication, 1st. Cast the nines out of the multiplicand, and set the excess at the right hand of a cross, thus, ×0.

2d. Cast the nines out of the multiplier, and set the excess at the left hand of the cross, thus, 0×.

3d. Cast the nines out of the product, and set the excess below the cross, thus, $\underset{0}{\times}$.

4th. Multiply the figures at the right and left of the cross, together; then cast the nines out of their product, and set the excess above the cross, thus, $\overset{0}{\times}$, which excess, (if the work be right,) will be just equal to that below the cross.

Q. If either the multiplicand or multiplier, or both, be less than nine, how do you proceed?

A. They are to be taken as the remainders.

NOTE.

Q. Of what use is Multiplication?

A. Multiplication is used to perform the work of many additions in the most concise manner.

MULTIPLICATION TABLE.

Q. How is the following Multiplication Table to be read?

A. Begin at the middle figure, and read thus; 2 times 2 are 4; 2 times 3 are 6; 2 times 4 are 8, &c.

2×2=	4	9×3=	27	9×5=	45	12×7=	84
3	6	10	30	10	50	8×8=	64
4	8	11	33	11	55	9	72
5	10	12	36	12	60	10	80
6	12	4×4=	16	6×6=	36	11	88
7	14	5	20	7	42	12	96
8	16	6	24	8	48	9×9=	81
9	18	7	28	9	54	10	90
10	20	8	32	10	60	11	99
11	22	9	36	11	66	12	108
12	24	10	40	12	72	10×10=	100
3×3=	9	11	44	7×7=	49	11	110
4	12	12	48	8	56	12	120
5	15	5×5=	25	9	63	11×11=	121
6	18	6	30	10	70	12	132
7	21	7	35	11	77	12×12=	14
8	24	8	40				

EXAMPLES.

NOTE.—The method of proceeding in Simple Multiplication illustrated.

1. Multiply 50621 by 6.

	Hund. of Thous.	Tens of Thous.	Thousands.	Hundreds.	Tens.	Units.	
Factors.		5	0	6	2	1	Multiplicand.
						6	Multiplier.
	3	0	3	7	2	6	Product, or answer.

Proof by casting out the nines.

3
6×5
3

5
×6
—
30 the product of 5 and 6.

NOTE.—To find the answer or product of the numbers here given to be multiplied, begin with the multiplier (6) and the unit figure (1) in the multiplicand, and say, 6 times 1 is 6, which *product* (6) being less than *ten*, set down directly under the multiplier; proceed to the *ten's* place, and say, 6 times 2 are 12, which *product* (12) is an *excess* of 2 over an *even* number of *tens;* therefore set down 2 under the column, and carry 1 for the number of *tens;* proceed to the next column, and say, 6 times 6 are 36 and 1 which was carried is 37, which *product* (37) is an *excess* of 7 over an *even* number of *tens;* therefore set down 7 under the column, and carry 3 for the number of *tens;* proceed to the next column, and say, 6 times 0 is nothing, but 3 which were carried, are 3, which (3) set down under the column; proceed to the next column, and say, 6 times 5 are 30, which *product* (30) being produced from the last column in the sum, set down, placing the 0 directly under the column, and carrying the 3 and setting it in the next place, (which being the *hundreds of thousand's* place,) and the work is done.

To prove the work, begin with the unit figure (1) of the multiplicand, and say, 1 and 2 are 3, and 6 are 9, which (9) being *even nines*, neglect it, and begin anew, by saying 0 is nothing, but 5 is 5, which (5) being the remainder of the multiplicand, set it at the *right hand* of the cross. Then, as the multiplier (6) is less than *even nines*, set it at the *left hand* of the cross. Then begin with the unit figure (6) of the product, and say, 6 and 2 are 8, and 7 are 15, which (15) being an *excess* of *even nines* by 6, drop the 9, and begin anew, by saying 6 (the *excess* of *even nines*,) and 3 are 9, which (9) being *even nines*, neglect it; then say, 0 is nothing, but 3 is 3, which (3) being the remainder of the product, set it *below* the cross. Then multiply the 5 at the *right* of the cross, by the 6 at the *left* of the cross, the *product* of which is 30; then cast the *nines* out of the 30 by saying, 0 is nothing, but 3 is 3, which (3) being the remainder of the 30, set *above* the cross, and which (3) corresponding with the number *below* the cross, proves the work to be *correct.*

	2.	3.	4.
Multiplicand,	22222	33333	44444
Multiplier,	4	5	6
Product,			

	5.	6.	7.
		Dollars.	*Pounds.*
Multiplic.	55555	160606	777077
Multiplier,	7	8	9
Product,			

	8.	9.	10.
	Yards.	*Gallons.*	*Miles.*
Multiplic.	880088	909909	123456
Multiplier,	10	11	12
Product,			

	11.	12.	13.
	Eagles.	*Bushels.*	*Days.*
Multiplic.	987654	801108	108801
Multiplier,	9	11	12
Product,			

	14.	15.	16.
	Acres.	*Tons.*	*Years.*
Multiplic.	5559718	8888889	9182736
Multiplier,	8	9	11
Product,			

17. Multiply 140625 by 6. *Ans.* 843750.
18. Multiply 3302033 by 1. *Ans.* 3302033.

19. Multiply 6270101×7. *Ans.* 43890707.
20. Multiply 1472501×8. *Ans.* 11780008.
21. Multiply 223021×9. *Ans.* 2007189.
22. Multiply 8252922×11. *Ans.* 90782142.

CASE II.

RULE.

Q. When the multiplier exceeds twelve, how do you proceed?

A. When the multiplier exceeds twelve, place the multiplier under the multiplicand as in Case I.; then multiply the multiplicand by each figure in the multiplier separately; taking care to place the first figure of each product directly under the figure by which you multiply; having gone through in this manner with each figure in the multiplier, add all the products together, and their amount will be the total product, or answer.

EXAMPLES.

1. What is the product of 1234012 multiplied by 53?

Operation. *Proof.*

Fac- } 1 2 3 4 0 1 2 Multiplicand. 5
tors. } 5 3 Multiplier. 8×4
5

3 7 0 2 0 3 6 Prod. by the units (3) of the multip.
6 1 7 0 0 6 0 Prod. by the tens (5) of the multip.

6 5 4 0 2 6 3 6 Total product, or answer.

NOTE.—To find the product of the numbers here given to be multiplied, first multiply each figure in the multiplicand by the *units* [3] in the multiplier, the product of which set down below the multiplier; then multiply each figure in the multiplicand by the *tens* [5] in the multiplier, the product of which, set down below the *first* product, remembering to place the first figure of it directly under the *tens* [5] in the multiplier; lastly, add both the products together, the amount of which, will give the total product, or answer.

To prove the work, cast the *nines* out of the multiplicand, and also out of the multiplier; then place their remainders, the *first* [4] at the *right*, and the *last* [8] at the *left* of the cross; then cast the *nines* out of the *total* product, and set the remainder [5] *below* the cross; lastly, multiply the 4 and 8 [at the *right* and *left* of the cross] together, the product of which is 32; then by casting the *nines* out of 32, leaves a remainder of 5, which [5] set *above* the cross, and the work is then proved as in Case I.

	2.	3.	4.
	Rods.	*Loads.*	*Chains.*
Multiplic.	45706	14091652	571983
Multiplier	29	75	184
Prod.	1325474	1056873900	105244872

5. Multiply 1109 by 18. *Ans.* 19962.
6. What is the product of 10313 multiplied by 38? *Ans.* 391894.
7. What is the product of 204573×44? *Ans.* 9001212.
8. Multiply 11147×67. *Ans.* 746849.
9. Multiply 1140596×79. *Ans.* 90107084.
10. Multiply 1197516×86. *Ans.* 102986376.
11. Multiply 238835×91. *Ans.* 21733985.
12. Multiply 1409388×103. *Ans.* 145166964.
13. Multiply 274796×114. *Ans.* 31326744.
14. What number is equal to 566 times 247601? *Ans.* 140142166.
15. What is the product of 432 times 1490817? *Ans.* 644032944.
16. What is the total product of 8670052 multiplied by 8971? *Ans.* 77779036492.

CASE III.

RULE.

Q. When the multiplier is a Composite number, *i. e.* any number which may be produced *exactly* by multiplying two or more numbers together, how do you proceed?

A. Place the multiplicand, and multiply it *first* by one of the component parts, and the product thence arising by the other, &c. the last product will be the answer. Thus, 24 which arises from the multiplication of 3 and 8, (3 times 8 are 24,) is a *composite number;* and these numbers 3 and 8 are called *component parts.*

PROOF.

Q. How do you prove Multiplication, when the multiplier is a Composite number?

A. Cast the *nines* out of the multiplicand and multiplier as in Case I. and II.; then cast the *nines* out of the last product, and proceed exactly as in Case I.

EXAMPLES.

1. What is the product of 794069 multiplied by 28?

	Operation.		*Proof.*
	794069	Multiplicand.	8
	4	One of the component parts.	1×8
4×7=28			8
	3176276	Product of the multiplicand, multiplied by 4.	
	7	The other component part.	
	22233932	Prod. of the multiplic. multiplied by 7 times 4.	

NOTE.—To find the product of the numbers here given to be multiplied, consider first what two numbers multiplied together will produce 28, *i. e.* what the component parts of 28 are; they being ascertained to be 4 and 7, (4 times 7 are 28,) first multiply each figure in the multiplicand by the 4, the product of which set down below the multiplier (4;) then multiply each figure in that product (obtained by 4) by the 7, the product of which, set down below the multiplier (7,) and it will be the total product, or answer.

To prove the work, cast the *nines* out of both the multiplicand and multiplier (28;) and also out of the last product, placing the remainders in their proper places by the cross as in Case I.; and also, *proved* as in Case I.

2. Multiply 41939 by 5×7=35. *Ans.* 1467865.
3. Multiply 546237×21. *Ans.* 11470977.
4. Multiply 1470014×32. *Ans.* 47040448.
5. Multiply 978097×49. *Ans.* 47926753.
6. Multiply 40012016×54. *Ans.* 2160648864.
7. Multiply 746813×63. *Ans* 47049219.
8. Multiply 12881709×72. *Ans.* 927483048.
9. Multiply 14697236×84. *Ans.* 1234567824.
10. Multiply 101019192×99. *Ans.* 10000900008.
11. Multiply 11430647×108. *Ans.* 1234509876.
12. Multiply 74961×121. *Ans.* 9070281.
13. Multiply 7482206×132. *Ans.* 987651192.
14. Multiply 6944×144. *Ans.* 999936.

15. Multiply 900009×99. *Ans*. 89100891.

16. How many pounds added to 49+18=24×6? *Ans*. 77 pounds.

17. How many pounds subtracted from 49—18=4×6? *Ans*. 7 pounds.

18. When Christ expired on the cross, the rich veil curiously embroidered with purple, blue, and red silk, 75 cubits long and 16 wide, which hung at the entrance of the temple, was rent in twain: How many cubits did the veil contain? *Ans*. 1200.

CASE IV.

RULE.

Q. When there are cyphers on the right hand of either the multiplicand, multiplier, or both, how do you proceed?

A. Place the significant figures of the multiplier directly under those of the multiplicand: multiply the significant figures in the multiplicand by those in the multiplier only, (neglecting the cyphers at the right hand of each,) and add together their several products; then place at the right hand of the total product, as many cyphers as there are in both the factors.

PROOF.

Q. How do you prove multiplication in Case IV?

A. By casting out the *nines* as in the preceding Cases.

EXAMPLES.

1. What is the product of 654000 multiplied by 4500?

	Operation.		*Proof.*
Factors.	654000	Multiplicand.	0
	4500	Multiplier.	0×6
			0
	3270	Prod. by the hundreds (5) of the multip.	
	2616	Prod. by the thousands (4) of the multip.	
	2943000000	Total product, or answer.	

NOTE.—To find the product of the numbers here given to be multiplied, first multiply each significant figure in the multiplicand by the *hundreds* (5) in the multiplier, the product of which, set down below the multiplier; then multiply each significant figure in the multiplicand by the *thousands* (4) in the multiplier, the product of which, set down below the *first* product; add both the products together, the amount of which, after bringing down all the cyphers neglected, will be the total product, or answer.

To prove the work, proceed as in Case II.

2. Multiply 7290000 by 1320. *Ans.* 9622800000.
3. Multiply 876100×97000. *Ans.* 84981700000.
4. Multiply 13904720×8110000. *Ans.* 112767279200000.
5. Multiply one million by one thousand. *Ans.* 1000000000.
6. Multiply 672 million by 97 thousand. *Ans.* 65184000000000.
7. 14072000×89100=1253815200000.
8. Multiply 6159×1234000. *Ans.* 7600206000.
9. Multiply 12340000×934. *Ans.* 11525560000.
10. The mines of Adria, in Bohemia, discovered 300 years ago, produce 100 tons weight of mercury yearly: How much did they produce in those 300 years at that rate? *Ans.* 30000 tons.
11. The celebrated Mr. Wright walked 60 miles a day for 20 days: How far did he walk? *Ans.* 1200 miles.

CASE V.

RULE.

Q. When there are cyphers between the significant figures of the multiplier, how do you proceed?

A. Place the multiplier under the multiplicand, units under units, &c. Multiply by the significant figures only, and omit the cyphers; observing always to place the first figure of each product directly under that figure by which you multiply; add all the products together, and their amount will be the total product, or answer.

PROOF.

Q. How do you prove multiplication in Case V.

A. By casting out the *nines* as in Case IV.

EXAMPLES.

1. What is the product of 142076 multiplied by 80002?

Operation.			*Proof.*
Factors.	1 4 2 0 7 6	Multiplicand.	2
	8 0 0 0 2	Multiplier.	1×2
			2
	2 8 4 1 5 2	Prod. by the units [2] of the multip.	
	1 1 3 6 6 0 8 0 0 0	Prod. by the *tens* of thous. [8] of the multiplier.	
	1 1 3 6 6 3 6 4 1 5 2	Total product, or answer.	

NOTE.—To find the product of the numbers here given to be multiplied, first multiply each figure in the multiplicand by the units (2) in the multiplier, the product of which set below the multiplier; bring down the three cyphers, and place them directly under their places in the multiplier; then multiply each figure in the multiplicand by the *tens of thousands* (8) in the multiplier, the product of which, set down below the *first* product; add together both products, the amount of which, will be the total product, or answer.

To prove the work, cast out the *nines* as in Case IV.

2. Multiply 94800167 by 20103.
Ans. 1905767757201.
3. Multiply 127100×70060. *Ans.* 8904626000.
4. Multiply nine millions by 40060.
Ans. 360540000000.
5. 9640027×5109030=49251187143810.

CASE VI.

RULE.

When the multiplier is 10, 100, 1000, &c. place the cyphers in the multiplier at the right hand of the multiplicand, and the work is done.

EXAMPLES.

1. Multiply 729 by 10=7290 product, or answer.
2. Multiply 1405×100=140500 *Ans.*
3. Multiply 90712×1000=90712000 *Ans.*
4. Multiply 99 millions by 10000=990000000000 *Ans.*

CASE VII.

RULE.

When the multiplier is 9, 99, 999, &c., set down the multiplicand, and place as many cyphers at the right hand, as there are figures of 9 in the multiplier, and suppose it a minuend; place the multiplicand under the *supposed* minuend for a subtrahend; then subtract it from the minuend, and the difference will be the total product, or answer.

PROOF.

Q. How do you prove Multiplication in Case VII.
A. By casting out the *nines* as in Case II.

EXAMPLES.

1. What is the product of 12034 multiplied by 99?

Operation.

1 2 0 3 4 0 0 Multiplic. with two cyphers annexed for a minuend.
1 2 0 3 4 Multiplic. here used as a subtrahend. *Proof.*
0
1 1 9 1 3 6 6 Difference is the total product, or answer. 0×1
0

NOTE.—To find the product of the numbers here given, set down the multiplicand, to the right hand of which, annex two cyphers; then place the multiplicand underneath, with units under units, tens under tens, &c.; lastly, subtract the lower number from the upper one, and the difference will be the product, or answer.

To prove the work, cast the *nines* out of the upper number, and also out of the multiplier (99) as in Case II.; then cast the *nines* out of the answer, and proceed as in Case II.

2. Multiply 6407 by 9. *Ans.* 57663.
3. Multiply 17167 by 999. *Ans.* 17149833.
4. Multiply 94217 by 9999. *Ans.* 942075783.
5. Multiply 823007 by 99999. *Ans.* 82299876993.

Exercises in the preceding Cases.

1. It is calculated that 13500000 tons of water descend at the falls of Niagara every hour: How much at that rate falls every day? *Ans.* 324000000 tons.

2. In 1820, the workmen employed in the National Armoury at Springfield (Mass.) amounting to 245, finished, on an average, 270 muskets, weekly: How many did they finish yearly at that rate? *Ans.* 14040.

3. The steam engines employed in some of the Cornish mines, discharge 960 hogsheads of water an hour incessantly: How much is that a day? *Ans.* 23040 hhds.

4. Four engines in one of the collieries at Whitehaven, discharge 20 hogsheads of water a minute: What is that an hour? *Ans.* 1200 hhds.

5. In April 1818, Dr. Crisp accomplished his unparalleled undertaking of walking to and from Oxford and London, for 17 successive days, at the rate of 61 miles a day: How many miles did he walk within that time?

Ans. 1037 miles.

Exercises in Subtraction and Multiplication.

1. The A. B. S. during A. D. 1818, printed 47300 copies of the Bible, and 24000 do. of the New Testament, and its funds, received the same year, amounted to 60 cents a copy; and during the 3 years it had existed, it printed 105270 copies of the Bible and Testament: To what did the funds, received during 1818, amount; and how many more copies were printed in the 3 years, than in that year?

Ans. { $42780 amount of funds.
33970 copies.

NOTE.—In the above sum, after multiplying the number of copies printed in 1818 by 60 cents, point off the two right hand figures of the product for cents, the rest will be dollars.

MULTIPLICATION OF FEDERAL MONEY.

RULE.

Q. How do you place the numbers to be multiplied?

A. In multiplying Federal Money, place the numbers according to their value; *i. e.* dollars under dollars, cents under cents, &c. and proceed exactly as in whole numbers.

Q. Where do you place the separatrix in the product?

A. Place the separatrix as many figures from the right hand, as there are figures at the right of the separatrix in both the factors; and if there be not so many decimal places in the product, supply the defect by prefixing cyphers at the left hand.

Q. When there are more than three decimal figures, what do they signify?

A. When there are more than three decimal fractions, all the figures to the right hand of mills, or the third place, are decimal parts of a mill.

NOTE.

Q. What do dollars multiplied by dollars, produce, &c.?

A. Dollars multiplied by dollars produce dollars; also, dollars multiplied by dimes, produce dimes; dimes multiplied by dimes, produce tenths of dimes; dollars multiplied by cents, produce cents; dimes by cents, tenths of cents; cents by cents, hundredths of cents; dollars by mills, produce mills; dimes by mills, tenths of mills; cents by mills, hundredths of mills; mills by mills, thousandths of mills, &c.

Q. What do dimes multiplied by dollars, produce, &c.?

A. Dimes multiplied by dollars, produce dimes; also, cents multiplied by dollars, produce cents; cents by dimes, produce mills; mills by dollars, produce mills; mills by dimes, produce tenths of mills; mills by cents, produce hundredths of mills, &c.

EXAMPLES.

NOTE.—The method of proceeding in Multiplication of Federal Money illustrated.

1. What is the product of $74,912 multiplied by $2,051?

	$ c. m.		*Proof.*
Factors.	74,912	Multiplicand.	4
	2,051	Multiplier.	8×5
			4
	74 912	Prod. by the mills, or thous. (1) of the Multip.	
	3 745 60	Prod. by the cts. or hund'ths. (5) of the Multip.	
	149 824 0	Prod. by the dollars, or units (2) of the Multip.	
	$153,644 512	Total product, or answer.	

NOTE.—To find the total product of the numbers here given to be multiplied, begin and multiply each figure in the multiplicand by the mills, or thousandths (1) in the multiplier, the product of which, set below the multiplier; then multiply each figure in the multiplicand by the cents, or hundredths (5) in the multiplier, the product of which, set below the *first* product; the *tenths* being a cypher, omit it, except bringing it down; then multiply each figure in the multiplicand by the dollars, or units (2) in the multiplier, the product of which, set below the *second* product; add the *three* products together, the amount of which, set underneath, and it will be the total product, or answer.

To prove the work, first cast the *nines* out of the multiplicand, the remainder of which being 5, place at the right hand of the cross; then cast the *nines* out of the multiplier, the remainder of which being 8, place at the left hand of the cross; then cast the *nines* out of the total product, the remainder of which being 4, place below the cross; lastly, the product of the remainders of the multiplicand and multiplier being 40, cast out the *nines*, the remainder of which being 4, place above the cross, which (4) corresponding with the figure below the cross, proves the work to be correct.

2. Multiply $27 by $12. *Ans.* $324.
3. Multiply $80,06×$17,40. *Ans.* $1393,044.
4. Multiply $27,27×$12,12. *Ans.* $330,5124.
5. Multiply $0,27×$0,12. *Ans.* $0,0324.

Note.—In the product of the above sum, and also in the following sums, when there is no whole number, a cypher is expressed in the unit's place with the character $ signifying dollars, cents, &c prefixed.

6. Multiply $1,95×$0,06. *Ans.* $0,1170=$0,117.
7. Multiply $0,555×$0,55. *Ans.* $0,30525.
8. Multiply $9,879×$0,004. *Ans.* $0,039516.
9. Multiply $649×$27,01. *Ans.* $17529,49.
10. Multiply $60×$0,60. *Ans.* $36.
11. Multiply $0,80×$80. *Ans.* $64.
12. Multiply $0,25×$0,25. *Ans.* $0,0625.
13. Multiply $21×$0,08. *Ans.* $1,68.
14. Multiply nine dollars by six dimes.
Ans. 54 dimes, equal to $5,40.

Note.—In placing the numbers in the above sum, call the six dimes, sixty cents

15. Multiply seven dimes by seven dimes.
Ans. 49 tenths of dimes, equal to $0,49.
16. Multiply nine dimes by eight cents.
Ans. 72 tenths of cents, equal to $0,072.
17. Multiply seven cents by four cents.
Ans. 28 hundredths of cents, equal to $0,0028.
18. Multiply $4 by eight mills.
Ans. 32 mills equal to $0,032.
19. Multiply $0,70 by $0,006.
Ans. 42 tenths of mills, equal to $0,0042.
20. Multiply nine cents by eight mills.
Ans. 72 hundredths of mills, equal to $0,00072.
21. Multiply seven mills by five mills.
Ans. 35 thousandths of mills, equal to $0,000035.
22. Multiply $5,006 by $1,469. *Ans.* $7,353814.
23. Multiply $5,466 by $1,009. *Ans.* $5,515194.
24. How many dollars added to $36+$14=$12×$8 ?
Ans. $46.
25. How many dollars subtracted from $36—$4=$8 ×$3 ? *Ans.* $8.

Questions and Exercises in Multiplication of Federal Money.

Q. In finding the value of Goods, and in making out bills of Parcels, when the price of one yard, pound, &c. is given, how do you find the value of the whole quantity?

A. Multiply the given price by the quantity, and place the separatrix as many figures from the right hand of the product, as there are in the given price.

EXAMPLES.

1. What is the value of a bundle of cotton, weighing 88 pounds, at $0,19 a pound? *Ans.* $16,72.

2. What is the value of a bundle of cinnamon, weighing 60 pounds, at thirty-seven cents a pound? *Ans.* $22,20.

3. What is the value of 112 pounds of Hyson-skin tea, at $2,125 a pound? *Ans.* $238.

4. What cost 27 pounds Havana sugar, at nineteen cents a pound? *Ans.* $5,13.

5. What cost 148 barrels of flour, at $11,50 a barrel? *Ans.* $1702.

6. Sold 297 pieces of calico, at $30,25 a piece: For how much was the calico sold? *Ans.* $8984,25.

7. What cost 719 yards of Russia diaper, at $0,425 a yard? *Ans.* $305,575.

8. What cost 144 dozen of lemons, at twenty-five cents a dozen? *Ans.* $36.

9. What cost 355 bushels of barley, at $1,07 a bushel? *Ans.* $379,85.

10. What cost 90 tons of hay, at $18,50 a ton? *Ans.* $1665.

11. Sold 965 acres of land, at $9,65 an acre: For how much was the land sold? *Ans.* $9312,25.

12. Fifty-four men receive a certain sum of money, of which each man receives $294: What is the amount which the whole receive? *Ans.* $15876.

13. What cost 75 pairs of boots, at $7,09 a pair? *Ans.* $531,75.

14. Bought 685 pairs of kid gloves, at seventy-five cents a pair? *Ans.* $513,75.

15. A. paid $2,83 a week for board and other neces-

sary expenses, for the term of 11 weeks: To what did it amount? *Ans.* $31,13.

16. If my income be $10,986 a week, how much is it a year at that rate? *Ans.* $571,272.

17. What cost 1007 yards of book muslin, at $0.755 a yard? *Ans.* $760,285.

18. Sold 175 yards of broadcloth, at six dollars a yard: To what did it amount? *Ans.* $1050.

19. Bought 17 tons of white lead, at $320 a ton: To what did it amount? *Ans.* $5440.

20. What cost 890 casks of linseed oil, at $39 a cask? *Ans.* $34710.

21. If 1 barrel of rosin cost $4,055, what will 1173 barrels cost at that rate? *Ans.* $4756,515.

22. Suppose you purchase 90 tons of cordage at $195 a ton: To what will it amount? *Ans.* $17550.

23. What cost 193 pieces of India cotton, at $9,872 a piece? *Ans.* $1905,296.

24. At the Mint, 35000 eagles can be coined in a week: How many can be coined in a year at that rate? *Ans.* 1820000.

25. The Capitol of the State of N. York at Albany, cost $110685; allowing 22 States in the Union, and 1 Capitol to each, what would the whole number of Capitols cost at that rate? *Ans.* $2435070.

26. In 1818, the U. States purchased of the Indians, seven millions acres of lands in Ohio and Illinois, for which they were to pay $28000 in specie, annually for ever; suppose it cost $0,095 an acre, to what did it amount? *Ans.* $665000.

27. In Dec. 1818, eighty thousand dollars worth of produce was sent to the N. York market, from Dutchess county, in one week: To what would it amount in a year at that rate? *Ans.* $4160000.

28. The aggregate distance of the grand canal from lake Erie to the Hudson, is 353 miles, (being on an air line 280 miles,) and the average expense a mile was estimated at about $13829: To what did the whole expense of making it amount? *Ans.* $4881637

29. The amount of salaries paid, during the year 1819, to the Clerks in the different offices of the Treasury de-

partment of the U. States, was $192649,95; to what would it amount in 25 years at that rate?
Ans. $4816248,75.

30. In 1818, the N. York School Fund amounted to one million dollars, besides eighty thousand acres of land; reckoning the land at $3,125 an acre: To what did the whole fund amount? *Ans.* $1250000.

Note.—In the above sum, after finding the worth of the land at the price given, add it to the one million dollars.

31. What cost 110 bushels of wheat, at $2,10 a bushel?
Ans. $231.

32. What cost 119 casks of rice, at $9,17 a cask?
Ans. $1091,23.

33. What cost 29 reams of paper, at $5,31 a ream?
Ans. $153,99.

34. Sold 1500 pounds of pork, at seventeen cents a pound: To how much did it amount? *Ans.* $255.

35. Bought 19 hundred weight of cocoa, at $8,125 a hundred weight: To what did it amount?
Ans. $154,375.

36. What cost 62 gallons of brandy, at $2,59 a gallon?
Ans. $160,58.

37. What cost 183 pounds of indigo, at $4,27 a pound?
Ans. $781,41.

38. B. rented a farm consisting of 310 acres, at $0,955 an acre: To what did the rent amount? *Ans.* $296,05.

39. Suppose a reckoning be paid equally among 44 men: To how much would it amount at $2,505 a man?
Ans. $110,22.

40. What cost one dozen of hats, at $9,06 a piece?
Ans. $108,72.

41. What cost 45 tons of hay, at $17,75 a ton?
Ans. $798,75.

42. If a road of 319 rods can be made at $1,015 a rod, what will be the expense of making it? *Ans.* $323,785.

43. A merchant had 69 debtors, each of which owed him $73,095: What was the whole amount which they owed him? *Ans.* $5043,555.

44. A. sold 9001 sheep, at $1,909 a piece: To what did they amount? *Ans.* $17182,909.

45. If you spend $58,334 a month, what do you spend a year at that rate? *Ans.* $700,008.

46. The lateral canal leading from the grand canal to the Salina salt-works in the State of N. Y. is 123 chains in length, and cost at the rate of $49,139 a chain: What did the whole of the canal cost? *Ans.* $6044,097.

47. How many dollars multiplied by $2×$2=$8+$4? *Ans.* $3.

48. How many dollars multiplied by $2×$2=$16—$4? *Ans.* $3.

BILLS OF PARCELS.

1. What is the amount of the following bill of parcels?

New-Haven, June 10th, 1820.

Ogier Export, Bo't of Abraham Mechanico.

2	pieces Irish linen,	at $7,65	a piece,	$
23	yards durant,	at $0,45	a yard,	
14	do. book muslin,	at $0,78	do.	
19	do. black calimanco,	at $0,39	do.	
9	do. gold cord, No. 2,	at $2	do.	
10	pieces blue satin, No. 1,	at $7	a piece,	
2	yards fine muslin, No. 3,	at $4	a yard,	
1	paper pins,	at $0,69,		
				$140,67

Received payment,

ABRAHAM MECHANICO.

2. What is the amount of the following bill of parcels?

New-York, Oct. 1st, 1820.

Sam. Purchase, Bo't of Obed, Merchant, & Co.

34	pounds loaf sugar,	at $0,18	a pound,	$
8	do. hyson tea,	at $1,34	do.	
16	gallons sherry wine,	at $1,67	a gallon,	
12	do. molasses,	at $0,54	do.	
17	do. spirits,	at $1,04	do.	
29	do. cogniac brandy,	at $1,87	do.	
				$121,95

Received payment in full,

OBED, MERCHANT, & CO.

3. What is the amount of the following bill of parcels?

Boston, August 23d, 1820.

Stansbury Paywell, Junr.

Bo't of J. L. Merchant & Sons.

7	pieces India satin,	at $46,25 a piece,	$
10	do. Italian crape,	at $74,15 do.	
21	yards English satin,	at $2,67 a yard,	
39	do. Canton crape,	at $2,84 do.	
8	do. checked muslin,	at $1,58 do.	
11	pieces cotton,	at $16,05 a piece,	
19	dozen pearl buttons,	at $0,75 a dozen,	
14	ounces twine,	at $0,09 an ounce,	
			$1436,78

Received payment,

For J. L. Merchant & Sons, *Wm. Wadsworth.*

MULTIPLICATION OF DECIMALS.

RULE.

Q. What is the method of placing the numbers to be multiplied?

A. Place them, whether mixed or pure decimals, under each other; according to the value of their places.

Q. How do you find the product; and how do you point off the places for decimals?

A. The product is found as in whole numbers; and the decimal places pointed off as in multiplication of Federal Money.

EXAMPLES.

Note.—The method of proceeding in multiplication of Decimals illustrated.

1. What is the product of 2,486 pounds multiplied by ,035 of a pound?

Units. Tenth parts. Hund. parts. Thous. parts.

Fac- } 2, 4 8 6 Multiplicand.
tors. } , 0 3 5 Multiplier.

1 2 4 3 0 Prod. by the thous. (5) of the multiplier.
7 4 5 8 Prod. by the hunds. (3) of the multiplier.

,0 8 7 0 1 0 Total product, or answer.

Proof.
7
8×2
7

NOTE.—To find the total product of the numbers here given to be multiplied, begin and multiply each figure in the multiplicand by the thousandths (5) in the multiplier, the product of which, set below the multiplier; then multiply each figure in the multiplicand by the hundredths (3) in the multiplier, the product of which, set below the *first* product; the *tenths* being a cypher, omit it, and add the *two* products together, the amount of which, set underneath; then as there is one place wanting, prefix a cypher to the left hand; and it will be the total product, or answer.

To prove the work, first cast the *nines* out of the multiplicand, the remainder of which being 2, place at the right hand of the cross; then cast the *nines* out of the multiplier, the remainder of which being 8, place at the left hand of the cross; then cast the *nines* out of the total product, the remainder of which being 7, place below the cross; lastly, the product of the remainders of the multiplicand and multiplier being 16, cast out the *nines*, the remainder of which being 7, place above the cross, which (7) corresponding with the figure below the cross, proves the work to be correct.

2. Multiply ,0064 by ,0007.	*Ans.* ,00000448.
3. Multiply ,009462×,0476.	*Ans.* ,0004503912.
4. Multiply 32,406×1,075.	*Ans.* 34,83645.
5. Multiply 14,596×,7432.	*Ans.* 10,8477472.
6. Multiply 792,9×84,65.	*Ans.* 67118,985.
7. Multiply ,91024×38,07.	*Ans.* 34,6528368.
8. Multiply 5794,1×4000,01.	*Ans.* 23176457,941.
9. Multiply ,00071047×,04062.	*Ans.* ,0000288592914.
10. Multiply $47,59×$21,06.	*Ans.* $1002,2454.
11. Multiply $9,00176×$0,47801.	*Ans.* $4,3029312976.
12. Multiply 4500×,7006.	*Ans.* 3152,7.

13. Multiply 82,5×64,75. *Ans.* 5341,875.

14. Multiply one million by one thousandth part of one. *Ans.* 1000.

15. Multiply fifty-six hundredths by forty-nine hundredths. *Ans.* ,2744.

16. Multiply nine hundred and seventeen thousandths by eight tenths. *Ans.* ,7336.

17. What cost 59,459 gallons of Madeira wine, at $2,102 a gallon? *Ans.* $124,982818.

18. What cost 69,25 sides of sole leather, at $5,65 a side? *Ans.* $391,2625.

19. What cost 749,59 pieces of India crape, at $42,0091 a piece? *Ans.* $31489,601269.

20. What cost 155,75 boxes of cotton balls, at $1,91 a box? *Ans.* $297,4825.

21. What cost 19,5 hundred weight of raisins, at $7,065 a hundred weight? *Ans.* $137,7675.

22. What cost 2198,75 yards of tape, at $0,019 a yard? *Ans.* $41,77625.

23. Sold 4,5 dozen of silver cups, at $13,14 a dozen: To what did they amount? *Ans.* $59,13.

24. In 1819, the mail was transported daily 20737 miles: How far was it transported yearly at that rate, allowing the year to contain 365,25 days? *Ans.* 7574189,25 miles.

SIMPLE DIVISION.

Q. What is Simple Division?

A. It is the dividing one number by another, without regard to their signification: as 8 divided by 4, the quotient is equal to 2.

Q. What does it teach?

A. It teaches to decrease the greater of two numbers given, as often as there are units in the less number.

Q. What are the Terms in Simple Division; and how are they known?

A. The Terms are *Dividend*, *Divisor*, *Quotient*, and *Remainder*; and are known by the Dividend being the number to be divided; the Divisor, the number to divide by; the Quotient, the number of times the Dividend contains the Divisor: and the Remainder, the number left after dividing, which is always less than the Divisor, and of the same denomination as the Dividend.

CASE I.

RULE.

Q. When the Divisor does not exceed twelve, how do you write down numbers to be divided?

A. Place the diviser, at the left hand of the dividend, and draw a line underneath.

Q. Where and how do you begin to divide a sum?

A. Begin with the divisor, and find how many times it is contained in the left hand figure of the dividend, and place it directly underneath.

Q. How do you proceed when the divisor exceeds the left hand figure of the dividend?

A. When the divisor exceeds the left of the dividend, proceed by finding how many times the divisor is contained in two or more figures of the dividend, and place the quotient under the right hand figure from which it is obtained, and it will be the highest figure of the quotient.

Q. How do you proceed, if after dividing any figure of the dividend, there be a remainder?

A. Call the remainder so many tens as it contains units, to which number annex the succeeding figure in the dividend; divide and set down as before, until the whole of the dividend is divided: the quotient will be the answer, or number of times that the dividend contains the divisor.

Q. When there is a remainder left, after the whole of the dividend is divided, what will it be?

A. It will be a fractional part of an unit or one, of the quotient.

PROOF.

Q. How is Simple Division proved?

A. If it be short division, multiply the quotient by the diviser, and add the remainder (if any) to the product. But if it be long division, add all the numbers subtracted and the remainder (if any) together; the amount will be just equal to the dividend.

NOTE.

Q. Of what use is Division ?

A. Division is to perform the work of several subtractions in the most concise manner.

DIVISION TABLE.

Q. How is the following Division Table to be read ?

A. Begin at the middle figure, and read thus : two in two, once ; two in four, twice ; two in six, three times, &c.

2÷2=1		4÷4=1		6÷6=1		8÷8=1	
4	2	8	2	12	2	16	2
6	3	12	3	18	3	24	3
8	4	16	4	24	4	32	4
10	5	20	5	30	5	40	5
12	6	24	6	36	6	48	6
14	7	28	7	42	7	56	7
16	8	32	8	48	8	64	8
18	9	36	9	54	9	72	9
3÷3=1		5÷5=1		7÷7=1		9÷9=1	
6	2	10	2	14	2	18	2
9	3	15	3	21	3	27	3
12	4	20	4	28	4	36	4
15	5	25	5	35	5	45	5
18	6	30	6	42	6	54	6
21	7	35	7	49	7	63	7
24	8	40	8	56	8	72	8
27	9	45	9	63	9	81	9

EXAMPLES.

NOTE.—The method of proceeding in Simple Division illustrated.

1. Divide 303726 by 6.

	H. of Thous.	T. of Thous.	Thousands.	Hundreds.	Tens.	Units.	
Divisor, 6)	3	0	3	7	2	6	Dividend.
		5	0	6	2	1	Quotient or answer.
						6	Divisor brought down for a multip.
	3	0	3	7	2	6	Proof.

Note.—To find the answer or quotient of the numbers here given to be divided, begin with the divisor (6) and the left hand figure (3) of the dividend, and say, 6 in 3, I cannot, therefore assume another figure (0) of the dividend, and inquire how often the divisor (6) is contained in them (30,) finding it to be 5 times, set down the 5 for the highest figure of the quotient directly under the 0 in the dividend; there being no remainder, proceed to the next place (3) in the dividend, and say, 6 in 3, I cannot, therefore set down a 0 in the quotient directly under the 3 in the dividend, and assume the next figure (7) of the dividend, and inquire how often the divisor (6) is contained in them (37,) finding it to be 6 times and 1 remainder, set down the 6 in the quotient directly under the 7 in the dividend, and call the remainder (1) *ten*, to which add the next figure (2) of the dividend, and inquire how often the divisor (6) is contained in them (12,) finding it to be 2 times, set down the 2 in the quotient directly under the 2 in the dividend; there being no remainder, proceed to the next place (6) in the dividend, and inquire how often the divisor (6) is contained in it (6,) finding it to be *once*, set down the 1 for the lowest figure of the quotient, and the work is done.

To prove the work, set the multiplier (6) under the unit figure of the quotient, and multiply each figure in the quotient by it (6,) the product of which being just equal to the dividend, proves the work to be correct.

	2.	3.	4.
	4)88888	5)166665	6)266664
Quotient,			

	5.	6.
		Dollars.
	7)388885	8)1284848
Quotient,		

	7.	8.
	Pounds.	*Yards.*
	9)6993693	10)8800880
Quotient,		

	9.	10.
	Gallons.	*Miles.*
	11)10008999	12)1481472
Quotient,		
Proof,		

11. *Eagles.* 9)8888886

12. *Bushels.* 11)8812188

Quotient,

Proof,

13. *Days.* 12)1305612

14. *Acres.* 8)44477744

Quotient,

Proof,

15. *Tons.* 9)80000001

16. *Years.* 11)101010096

Quo.

Proof,

17. Divide 843750 by 6. *Ans.* 140625.
18. Divide 3302033 by 1. *Ans.* 3302033.
19. Divide 43890707÷7. *Ans.* 6270101.
20. Divide 11780008÷8. *Ans.* 1472501.
21. Divide 2007189÷9. *Ans.* 223021.
22. Divide 90782142÷11. *Ans.* 8252922.

23. During four months preceding the 30th of Sept. 1818, 348 vessels sailed from Liverpool for ports in the U. States: How many was that a month? *Ans.* 87.

24. In 1818, 120000 copies of Mavor's Spelling Book and Pelham's London Primer were sold: How many was that a month for the year? *Ans.* 10000 copies.

25. During the year 1818, six millions of dollars were imported into Canton in American vessels: How much was that a month on an average? *Ans.* $500000.

26. The Russian Bible Society, when it had been in operation five years, had printed and had in the press, of

the whole Bible, and parts of the Bible, 270600 copies, in 21 languages or dialects: How many was that a year on an average? *Ans.* 54120.

CASE II.

RULE.

Q. When the divisor exceeds twelve, how do you write down numbers to be divided?

A. When the divisor exceeds 12, place the dividend between the lines of an inverted parenthesis, and the divisor at the left hand of the dividend; then as you proceed, place the quotient at the right hand of the dividend.

Q. What is the method of operation?

A. Assume as many figures of the left hand of the dividend as contain the divisor once or oftener; find how many times they contain it, and place the answer as the highest figure of the quotient. Multiply the divisor by the figure thus found, and place the product under those figures from which it was obtained. Subtract this product from the figures above it. Bring down the next figure of the dividend to the right of the remainder; divide the number it makes up, multiply and subtract as before, until every figure in the dividend is brought down and divided.

Q. When you bring down a figure to the right of the remainder, and the number it makes up is still less than the divisor, how do you proceed?

A. Place a cypher in the quotient, and bring down another figure, and proceed as before.

NOTE.

Q. When the amount of the two first figures of the dividend is less than the amount of the two first figures of the divisor, how do you proceed?

A. Assume one more figure of the dividend, without which, the figures assumed in the dividend will not measure the divisor.

Q. What is the most ready way to find the true quotient figure?

A. Multiply the left hand figure of the divisor, by such a number (less than ten) as will produce nearly, but not exceed, the amount of the two first figures of the dividend;

which number will probably be the true quotient figure: if not, one less must be the right number.

Q. When a figure is brought down from the dividend, and annexed to the remainder, should the number then be less than the divisor, what must be done?

A. Place a cypher in the quotient, and bring down the next figure of the dividend, &c.

Q. When the last figure of the dividend is annexed to the remainder, and the divisor should not be contained in that number, what will that number be?

A. It will be the true remainder; and a cypher must be placed in the quotient, for the figure thus brought down.

EXAMPLES.

1. What is the quotient of 65402637 divided by 53?

Operation.

```
Divisor.        Dividend.              Quotient.
   5 3 ) 6 5 4 0 2 6 3 7 ( 1 2 3 4 0 1 2 1/53
         5 3 . . . . . .
         --- . . . . . .
         1 2 4 . . . . .
         1 0 6 . . . . .
         ----- . . . . .
           1 8 0 . . . .
           1 5 9 . . . .
           ----- . . . .
             2 1 2 . . .
             2 1 2 . . .
             ----- . . .
                   6 3 .
                   5 3 .
                   --- .
                   1 0 7
                   1 0 6
                   -----
                       1 Remainder.
         ---------------
         6 5 4 0 2 6 3 7 Proof.
         ---------------
```

NOTE.—To find the quotient of the numbers here given to be divided, begin with the divisor (53) and the two first figures (65) of the dividend, and say, 53 in 65 *once*, which (1) set down at the right hand of the dividend as the highest quotient figure; then multiply the divisor by it, and place the product under the 65; then subtract the product from the 65, and it leaves a remainder of 12: bring down the next figure (4) of the dividend to the right of the remainder; then say, 53 in 124 *twice*, which (2) set down in the quotient; multiply the divisor by it, and place the product under the 124; then subtract the product from the 124, and it leaves a remainder of 18: bring down the next figure (0) of the dividend to the right of the remainder; then say, 53 in 180 *three times*, which (3) set down in the quotient; multiply the divisor by it, and place the product under the 180; then subtract the product from the 180, and it leaves a remainder of 21: bring down the next figure (2) of the dividend to the right of the remainder; then say, 53 in 212 *four times*, which (4) set down in the quotient; multiply the divisor by it, and place the product under the 212; then subtract the product from the 212, and it leaves no remainder: then bring down the next figure (6,) and say, 53 in 6, *no times;* therefore, bring down the next figure (3,) and say, 53 in 63, *once*, which (1) set down in the quotient; multiply the divisor by it, and place the product under the 63: then subtract the product from the 63, and it leaves a remainder of 10: bring down the next figure 7, and say, 53 in 107 *twice*, which (2) set down in the quotient; multiply the divisor by it, and place the product under the 107: then subtract the product from the 107, and it leaves a remainder of 1, which (1) with the divisor (53,) place as a fraction at the right hand of the quotient, and the work is done.

To prove the work, begin with the remainder (1,) and say, 1 and 6 are 7, which (7) set down; then say, 0 is nothing, but 3 is 3, which (3) set down; then say, 1 and 5 are 6, which (6) set down; then say, 2 is 2, which (2) set down; then say, 1 and 9 are 10, which (10) being *even* number of *tens*, set down the 0; then carry 1 to the 2, and say 1 to 2 is 3, and 5 are 8, and 6 are 14; set down the 4, and carry 1 to the 1, and say 1 to 1 is 2, but 0 is nothing, and 3 are 5, which (5) set down; lastly, say, 1 and 5 are 6, which (6) set down; then, the amount of the remainder and numbers subtracted, corresponding with the dividend, proves the work to be correct.

2.

Rods.

Divisor.	Dividend.	Quotient.
29)	1325474	(45706

3.

Loads.

Divisor.	Dividend.	Quotient.
75)	1056873900	(14091652

4.

Chains.

Divisor.	Dividend.	Quotient.
184)	103244872	(571983

5. Divide 19962 by 18. *Ans.* 1109.

6. What is the quotient of 391894 divided by 38? *Ans.* 10313.

7. What is the product of 9001212÷44? *Ans.* 204573.

8. Divide 746849÷67. *Ans.* 11147.

9. Divide 90107084÷79. *Ans.* 1140596.

10. Divide 102986376÷86. *Ans.* 119516.

11. Divide 21733985÷91. *Ans.* 238835.

12. Divide 145166964÷103. *Ans.* 1409388.

13. Divide 31326744÷114. *Ans.* 274796.

14. What number is equal to 140142166 divided by 566? *Ans.* 247601.

15. What number is equal to 644032944 divided by 432? *Ans.* 1490817.

16. What is the quotient of 77779036492 divided by 8971? *Ans.* 86700052.

17. If you divide $9938138 equally among 126 men, how many dollars will each man share? *Ans.* 78874\frac{14}{126}$.

18. When Belshazzar fell by the sword, the Assyrian monarchy ended, which from Nimrod had subsisted 1636 years in an uninterrupted succession of 38 sovereigns: How many years on an average would it give to each sovereign? *Ans.* 43$\frac{2}{38}$ years.

19. How many yards added to 5+4=72÷6? *Ans.* 3 yards.

20. How many yards subtracted from 24—9=72÷6? *Ans.* 3 yards.

21. How many yards multiplied by 2×2=72÷6? *Ans.* 3 yards.

22. In 1820, there were 68 printers of public papers in the U. States, who were authorized to publish the laws: How many printers were there to a State on an average; there being 24 States in the Union? *Ans.* 2$\frac{20}{24}$.

CASE III.

RULE.

Q. When the divisor is a Composite number, *i. e.* any number which may be produced by multiplying two or more numbers together, how do you proceed?

A. Place the dividend, and divide it first by one of the component parts, and the quotient thence obtained by the other, &c. the last quotient will be the answer.

PROOF.

Q. How do you prove division, when the divisor is a Composite number?

A. Multiply the last quotient by the last divisor, and the product thence arising by the first divisor.

NOTE.

Q. When there is a remainder how do you find the *total* remainder?

A. Multiply the last remainder by the first divisor, and add in the first remainder.

EXAMPLES.

1. What is the quotient of 22233932 divided by 28?

Operation.

4) 2 2 2 3 3 9 3 2 Dividend.
4×7=28 ———————— [by 4.
7) 5 5 5 8 4 8 3 Quo. of the div'd. divided
———————— [7 times 4.
7 9 4 0 6 9 Quo. of the div'd. divided by
7 Last divisor brought down.
————————
5 5 5 8 4 8 3
4 First divisor brought down.
————————
2 2 2 3 3 9 3 2 Proof.
————————

NOTE.—To find the quotient of the numbers here given to be divided, first find what the component parts of the divisor are, as in Case III. of Multiplication; then divide each figure in the dividend by 4, (one of the component parts,) the quotient of which, set down below the dividend; lastly, divide each figure in this quotient by the 7 (the other component part,) the quotient of which, set down below the first quotient, and it will be the *true* quotient or answer. *To prove the work*, multiply the last quotient by the last divisor (7,) the product of which, set down below; then multiply this product by the first divisor (4,) the product of which set down below, and the same corresponding with the dividend, proves the work to be correct.

2. Divide 1467865 by 5×7=35. *Ans.* 41939.

3. Divide 11470977÷21. *Ans.* 546237.

4. Divide 47040448÷32. *Ans.* 1470014.
5. Divide 47926753÷49. *Ans.* 978097.
6. Divide 2160648864÷54.. *Ans.* 40012016.
7. Divide 47049219÷63. *Ans.* 746813.
8. Divide 927483048÷72. *Ans.* 12881709.
9. Divide 1234567824÷84. *Ans.* 14697236.
10. Divide 10000900008÷99. *Ans.* 101019192.
11. Divide 1234509876÷108. *Ans.* 11430647.
12. Divide 9070282÷121. *Ans.* 74961.
13. Divide 987651192÷132. *Ans.* 7482206.
14. Divide 999936÷144. *Ans.* 6944.
15. Divide 89100891÷99. *Ans.* 900009.

16. Find how many times 144 is contained in one million. *Ans.* $6944\frac{64}{144}$.

NOTE.—In the above sum, there being a remainder of 64, draw a horizontal line at the right hand of the whole numbers in the quotient; then place the remainder (64) above the line, and the divisor (144) below it; the fraction thus formed, completes the quotient.

17. On the 18th of May, 1820, the anniversary of the introduction of the Vaccine into Prussia, the Physicians of Berlin held, as usual, a festival in honour of Dr. Jenner, as one of the greatest benefactors of humanity; the cases of vaccination which occurred in Prussia, during the preceding year, amounted to 350000: How many cases were there a month? *Ans.* $29166\frac{8}{12}$.

CASE IV.

RULE.

Q. When there are cyphers on the right hand of the divisor, how do you proceed?

A. Cut off the cyphers in the divisor, and the same number of figures from the right hand of the dividend; then divide the remaining figures as in Case II. and to the remainder, (if any,) annex those figures cut off from the dividend, and you will have the *true* remainder.

PROOF.

Q. How do you prove division in Case IV.?

A. By adding together the remainder, and numbers subtracted, as in Case II.

EXAMPLES.

1. What is the quotient of 654654 divided by 4500?

Operation.

$$\begin{array}{rl}
\text{Divisor.} & \text{Dividend.} \qquad \text{Quotient.} \\
45|00) & 6546|54(145\tfrac{2154}{4500}. \\
 & 45 \\ \cline{2-2}
 & 204 \\
 & 180 \\ \cline{2-2}
 & \;\;246 \\
 & \;\;225 \\ \cline{2-2}
 & \;\;\;\;2154 \text{ Remainder.} \\ \cline{2-2}
 & 654654 \text{ Proof.} \\ \cline{2-2}
\end{array}$$

Note.—To find the quotient of the numbers here given to be divided, cut off the two cyphers from the right hand of the divisor, and also the 54 from the right of the dividend; then divide the remaining figures of the dividend by the remaining figures of the divisor (45) as in Case II.; the whole numbers of the quotient being 145, and a remainder left of 21, bring down the 54 (cut off from the dividend) to the right of the remainder (21,) and it (2154) will be the *true* remainder; then draw a horizontal line at the right hand of the whole numbers of the quotient, and place the whole remainder above the line, and the divisor (4500) below it; it is then a fraction and completes the quotient.

To prove the work, add together the remainder and numbers subtracted, as in Case II.

2. Divide 9622800000 by 1320. *Ans.* 7290000.
3. Divide 84981700000÷97000. *Ans.* 876100.
4. Divide 112767279200000÷8110000. *Ans.* 13904720.
5. Divide one thousand millions by one thousand. *Ans.* 1000000.
6. Divide 65184000000000 by 97 thousand. *Ans.* 672 millions.
7. 12538157697÷891=140720$\frac{5697}{89100}$.
8. Divide 760020654÷65900. *Ans.* 11533$\frac{5954}{65900}$.
9. Divide 11525569728÷9340. *Ans.* 12340010$\frac{388}{9340}$.
10. The tea trade affords constant employment for

50000 tons of shipping, and sixty thousand seamen: How many seamen is that to each ton of shipping? *Ans.* $1\frac{1}{5}$.

11. In 1820, 1070500 children were learning to read and write in the minor schools of France, under the care of 28000 masters: How many children were under the care of each master on an average? *Ans.* $38\frac{65}{280}$.

CASE V.

RULE.

Q. When the divisor is 10, 100, 1000, &c. how do you proceed?

A. Cut off the number of cyphers in the divisor, also an equal number of figures from the right hand of the dividend, and the work is done; the figures that remain of the dividend are the quotient, and those cut off the remainder.

EXAMPLES.

1. Divide 7290 by 10=729 quotient, or answer.
2. Divide 140500÷100=1405 *Ans.*
3. Divide 90712000÷1000=90712 *Ans.*
4. Divide 990000000000÷10000=99 millions *Ans.*

Exercises in the preceding Cases.

1. In 1818, there were in Quebec 15237 inhabitants and 2008 houses: How many inhabitants were there on an average to each house? *Ans.* $7\frac{1181}{2008}$.

2. In May, 1818, the British and Foreign Bible Society had existed 14 years, and within that time, had distributed 2000000 Bibles and Testaments: How many was that a year? *Ans.* $142857\frac{2}{14}$.

3. In January, 1819, a Company of 40 men in Williamsburg District (S. C.) destroyed bears, wolves, wild-cats and crows, amounting to 14000: How many on an average did each man destroy, and how many of each an equal number, were destroyed?

Ans. { 350 each man destroyed.
3500 of each kind destroyed.

4. In 1819, the Philadelphia Sunday and Adult School Union Society contained 129 schools, 1431 teachers, and 12306 learners: How many learners, how many teachers,

and how many learners to a teacher, were there on an average to each school?

Ans. $\begin{cases} 95\frac{51}{120} \text{ learners to each school.} \\ 11\frac{12}{120} \text{ teachers to each school.} \\ 8\frac{858}{1431} \text{ learners to each teacher.} \end{cases}$

5. During three years, ending June 1819, 1231 families, comprising 10555 souls, emigrated from the port of Belfast, (Ireland,) to America: Of how many souls did each family consist, on an average? *Ans.* $8\frac{707}{1231}$.

6. The unevangelized population of the globe is estimated at 600 millions of souls: How many Missionaries would it require to supply every 20000 souls with *one?*
Ans. 30000.

7. The celebrated Mr. Wright walked 1200 miles in 20 days: How far is that a day? *Ans.* 60 miles.

8. During the season of 1818, the fare taken in lake Ontario, consisting of herrings, white fish, and salmon trout, amounted to 5600 barrels, valued at $44400: At how much was the fish valued a barrel? *Ans.* $$7\frac{52}{56}$.

Exercises in Division and Subtraction.

1. In 1819, there were in the ten wards of the city of New-York 119658 inhabitants, which was an increase of 19038, for the three preceding years: How many inhabitants did the city contain in 1816, and how many were there in each ward on an average in 1819?

Ans. $\begin{cases} \text{100620 inhabitants in 1816.} \\ 11965\frac{8}{10} \text{ do. in each ward in 1819.} \end{cases}$

2. The British and Foreign Bible Society has, from its establishment in 1814 to 1820, issued 2550000 Bibles and Testaments; and also assisted in translating, printing, or distributing the Scriptures or portions of them in 128 different languages and dialects: How many Bibles and Testaments did the Society issue annually, on an average; and how long was it from the establishment of the Society to the year 1820?

Ans. $\begin{cases} \text{425000 Bibles and Testaments.} \\ \text{6 years.} \end{cases}$

3. In 1820, there were 16 printing presses at Serampore, and the Holy Scriptures were printing in 25 Oriental languages; the Societies had under their care 111 native schools, in which 10000 native children had the

means of education: How many children were there to each school on an average; and how much did the number of children, exceed that of the schools?

Ans. $\begin{cases} 90\frac{10}{111} \text{ to each school.} \\ 9889. \end{cases}$

DIVISION OF FEDERAL MONEY.

RULE.

Q. How do you place the numbers to be divided?

A. Place them, and divide as in division of whole numbers.

Q. Where do you place the separatrix in the quotient?

A. If the divisor be an integer, place the separatrix in the quotient, when you have divided all the integers in the dividend. The remainder (if any) may be brought into lower denominations, by annexing cyphers, and dividing again. But, if the divisor consist of more than *one* denomination, place the separatrix in the quotient, when you have divided as many figures past the separatrix in the dividend, as there are figures at the right of the separatrix in the divisor. If there be not so many figures at the right of the separatrix in the dividend as there are in the divisor, supply the deficiency by annexing cyphers.

NOTE.

Q. What do the following denominations, by division, produce?

A. By dividing them as follows, they all produce dollars, viz. dollars by dollars; dollars by dimes; dimes by dimes; dollars by cents; dimes by cents; cents by cents; dollars by mills; dimes by mills; cents by mills; mills by mills; tenths of mills by tenths of mills; hundredths of mills by hundredths of mills, &c.

Q. What do dimes divided by dollars produce, &c.?

A. They produce dimes; also, cents divided by dollars, produce cents; cents by dimes, produce dimes; mills by dollars, produce mills; mills by dimes, produce cents; mills by cents, produce dimes, &c.

EXAMPLES.

Note.—The method of proceeding in Division of Federal Money illustrated.

1. What is the quotient of $153,648512 divided by $2,051 ?

```
 Divisor.         Dividend.            Quotient.
 $              $                     $
 2,0 5 1)1 5 3,6 4 8 5 1 2( 7 4,9 1 3 1949/2051.
         1 4 3 5 7 . . . .
         ---------- . . . .
           1 0 0 7 8 . . .
             8 2 0 4 . . .
        $  ---------- . . .
             1 8 7 4 5 . .
             1 8 4 5 9 . .
             ---------- . .
                 2 8 6 1 .
                 2 0 5 1 .
                 -------- .
                   8 1 0 2
                   6 1 5 3
                   -------
                   1 9 4 9 Remainder.
         -----------------
         1 5 3,6 4 8 5 1 2 Proof.
         -----------------
```

Note.—To find the quotient of the numbers here given to be divided, begin with the divisor (2051) and the five first figures (15364) of the dividend; the latter containing the former *seven* times, place the 7 at the right hand of the dividend as the highest quotient figure; multiply the divisor by it (7,) and place the product under the 15364; subtract the product therefrom, and it leaves a remainder of 1007; bring down the next figure (8) of the dividend, and find another figure of the quotient, and so proceed, till all the remaining figures of the dividend are brought down; this being done, there is a remainder left of 1949, which, with the divisor, place at the right hand of the whole numbers in the quotient as a fraction; the quotient or answer is then 74 dollars, 91 cents, 3 mills, and $\frac{1949}{2051}$ parts of a mill.

To prove the work, add the remainder, and all the numbers subtracted, together, the amount of which, corresponding with the dividend, proves the work to be correct.

2. Divide $324 by $12. *Ans.* $27.

3. Divide $1393,044÷$17,40. *Ans.* $80,06.
4. Divide $330,5124÷$12,12. *Ans.* $27,27.
5. Divide $0,0324÷$0,12. *Ans.* $0,27.

NOTE.—In the quotient of the above sum, and also in the following sums, when there is no whole number, a cypher is expressed in the unit's place with the character $ signifying dollars, cents, &c. prefixed.

6. Divide $0,117÷$0,06. *Ans.* $1,95.
7. Divide $0,30525÷$0,55. *Ans.* $0,555.
8. Divide $0,039516÷$0,004. *Ans.* $9,879.
9. Divide $17529,49÷$27,01. *Ans.* $649.
10. Divide $36÷$0,60. *Ans.* $60.
11. Divide $64÷$80. *Ans.* $0,80.
12. Divide $0,0625÷$0,25. *Ans.* $0,25.
13. Divide $1,68÷$0,08. *Ans.* $21.
14. Divide fifty-four dimes by six dimes.
Ans. 90 cents, equal to 9 dimes.

NOTE.—In placing the numbers in the above sum, call the fifty-four dimes, five dollars forty cents.

15. Divide forty-nine tenths of dimes by seven dimes.
Ans. $0,70.
16. Divide 72 tenths of cents by eight cents.
Ans. $0,90.
17. Divide 28 hundredths of cents by four cents.
Ans. $0,07.
18. Divide thirty-two mills by eight mills. *Ans.* $4.
19. Divide 42 tenths of mills by six mills.
Ans. $0,70.
20. Divide 72 hundredths of mills by eight mills.
Ans. $0,09.
21. Divide 35 thousandths of mills by five mills.
Ans. $0,007.
22. Divide $7,353814 by $1.469. *Ans.* $5,006.
23. Divide $5,515194 by $1,009. *Ans* $5,466.
24. How much added to $5+$4=$72÷$6 ?
Ans. $3.
25. How much subtracted from $24—$8=$72÷$6 ?
Ans. $4.
26. How much multiplied by $4×$3=$72÷$3 ?
Ans. $2.

Questions and Exercises in Division of Federal Money.

Q. In finding the value of Goods, when the value of the whole quantity is given, how do you find the price of one yard, pound, &c.

A. Divide the price of the whole by the quantity, and place the separatrix as in Division of Federal Money.

EXAMPLES.

1. If a bundle of cotton, weighing 88 pounds, cost $16,72, what is that a pound? *Ans.* $0,19.

2. If a bundle of cinnamon, weighing 60 pounds, cost $2220, what is that a pound? *Ans.* $0,37.

3. Bought 112 pounds of Hyson-skin tea, at $238: What did it cost a pound? *Ans* $2,125.

4. Sold 27 pounds Havana sugar, at $5,13: At how much a pound did it sell? *Ans.* $0,19.

5. Paid $1702, for 148 barrels of flour: What was that a barrel? *Ans.* $11,50.

6. Sold 297 pieces of calico for $8984,25: At how much was it sold a piece? *Ans.* $30,25.

7. What cost a yard of Russia diaper, if 719 yards cost $305,575? *Ans.* $0,425.

8. If 144 dozen of lemons cost $36, what is that a dozen? *Ans.* $0,25.

9. If 355 bushels of barley cost $379,85, what cost one bushel? *Ans.* $1,07.

10. What cost a ton of hay, if 90 tons cost $1665? *Ans.* $18,50.

11. A farmer sold 965 acres of land for $9312,25: At how much an acre did he sell it? *Ans.* $9,65.

12. Fifty-four men receive a sum of money amounting to $15876 to be equally divided among them: How much does each man receive? *Ans.* $294.

13. A shoe-maker sold 75 pairs of boots for $513,75: At how much a pair did he sell them? *Ans.* $7,09.

14. If 685 pairs of kid gloves cost $513,75, what cost one pair? *Ans.* $0,75.

15. A. paid $31,13 for eleven weeks board and other necessary expenses: What did he pay a week? *Ans.* $2,83.

16. My income is $571,272 a year: What is it a week? *Ans.* $10,986.

17. One thousand and seven yards of book muslin cost $760,285: What did it cost a yard? *Ans.* $0,755.

18. I sold 175 yards of broadcloth for $1050: At how much a yard did I sell it? *Ans.* $6.

19. Bought 17 tons of white lead for $5440: What did it cost a ton? *Ans.* $320.

20. What cost a cask of linseed oil, at $34710 for 890 casks? *Ans.* $39.

21. If 1173 barrels of rosin cost $4756,515, what cost one barrel? *Ans.* $4,055.

22. Suppose you purchase 90 tons of cordage for $17550: What do you give a ton? *Ans.* $195.

23. If 193 pieces of India cotton cost $1905,296, what will one piece cost? *Ans.* $9,872.

24. At the Mint 1820000 eagles can be coined in a year: How many can be coined in a week?
Ans. Thirty-five thousand.

25. If 110 bushels of wheat cost $231, what cost one bushel? *Ans.* Two dollars, ten cents.

26. What cost a cask of rice, if 119 casks cost $1091,23? *Ans.* $9,17.

27. If 29 reams of paper cost $153,99, what cost one ream? *Ans.* $5,31.

28. Bought 1500 pounds of pork for $255: What did it cost a pound? *Ans.* Seventeen cents.

29. Sold 19 hundred weight of cocoa for $154,375: At how much a hundred weight did it sell?
Ans. $8,125.

30. A grocer sold 62 gallons of brandy for $160,58: At how much a gallon did he sell it? *Ans.* $2,59.

31. If 183 pounds of indigo cost $781,41, what cost one pound? *Ans.* $4,27

32. B. rented a farm consisting of 310 acres, for $296,05: How much was the rent an acre? *Ans.* $0,955.

33. A reckoning of $110,22 was paid equally among forty-four men: How much did each man pay?
Ans. $2,505.

34. A hatter sold one dozen of hats for $108,72: At how much a piece did he sell them? *Ans.* $9,06.

35. What cost a ton of hay, if 45 tons cost $798,75?
Ans. $17,75.

36. A road of 319 rods was made for $323,785: What was that a rod? *Ans.* $1,015.

37. A merchant had 69 debtors which owed him

$5043,555 : What did each debtor owe him on an average ? *Ans.* $73,095.

38. A. sold 9001 sheep for $17182,909 : At how much a head did A. sell them ? *Ans.* $1,909.

39. If you spend $700,008 a year, what do you spend a month ? *Ans.* $58,334.

40. On July 17th, 1819, 118 deposits were made in the Savings Bank, N. York, amounting to $5908 : How much did the deposits average ? *Ans* $\$50,067\frac{94}{118}$.

41. During the season of 1818, the fare taken in lake Ontario, consisting of Herrings, White Fish and Salmon Trout, amounted to 5600 barrels, valued at $44400 : At what was the fish valued a barrel ? *Ans.* $\$7,928\frac{32}{56}$.

42. A mass of Amber weighing 13 pounds, lately found in Prussia, might have been sold in Constantinople for thirty thousand dollars : What is that a pound ?

Ans. $\$2307\frac{9}{13}$.

43. Divide $0,8 by $4. *Ans.* $0,2.

44. Divide $0,08÷$4. *Ans.* $0,02.

45. Divide $0,08÷$0,4. *Ans.* $0,2.

46. Divide $0,008÷$4. *Ans.* $0,002.

47. Divide eight mills by four dimes.

Ans. Two cents.

48. Divide eight mills by four cents.

Ans. Two dimes.

49. In 1819, there were on the Mississippi and its tributary waters, 61 steam-boats ; and the freight and passage money were calculated to amount to $2556660 annually : What was the average sum of each boat annually ?

Ans. $\$41912,459\frac{1}{61}$.

DIVISION OF DECIMALS.

RULE.

Q. What is the method of placing the numbers to be divided ?

A. Place them, whether mixed or pure decimals, as in division of Federal Money.

Q. How do you find the quotient ; and how do you point off the places for decimals ?

A. The quotient is found as in division of Federal

Money, and the decimals in the divisor and quotient, counted together, must be equal to those in the dividend; *i. e.* point off as many places for decimals in the quotient, as the decimal places in the dividend exceed those in the divisor.

Q. When the decimals in the quotient are not so many as the rule requires, how do you proceed?

A. Supply the deficiency by prefixing cyphers at the left hand.

Q. When there is a remainder, or the decimal places in the divisor exceed those in the dividend, how do you proceed?

A. Annex cyphers either to the dividend or remainder, and carry on the quotient to any degree of exactness.

EXAMPLES.

Note.—The method of proceeding in Division of Decimals illustrated.

1. What is the quotient of 2,499 pounds divided by ,035 of a pound?

```
Divisor.  Dividend.  Quotient.
 Pounds.   Pounds.    Pounds.
 ,0 3 5)2,4 9 9(7 1,4
        2 4 5
        -----
            4 9
            3 5
            ---
            1 4 0 Cypher annexed.
            1 4 0
            -----
                0 No remainder.
        -----------
        2,4 9 9 0 Proof.
        -----------
```

Note.—To find the quotient of the numbers here given to be divided, begin with the divisor (35) and the three first figures (249) of the dividend; the latter containing the former *seven* times, place the 7 at the right hand of the dividend as the highest quotient figure; multiply the divisor by it (7,) and place the product under the 249; subtract the product therefrom, and it leaves a remainder of 4, to which, bring down the remaining figure (9) of the dividend; the divisor being contained in the 49 *once*, place the 1 in the quotient; after multiplying and subtracting, there being a remainder of 14, annex a cypher thereto; then the 140 containing the divisor *four* times, place the 4 in the quotient, and point it (4) off for a decimal; then the decimals in the divisor and quotient will be equal to those in the dividend.

To prove the work, add the remainder and all the numbers subtracted together, the amount of which, corresponding with the dividend, proves the work to be correct.

2. Divide ,00000448 by ,0007. *Ans.* ,0064.

3. Divide ,0004503912÷,0476. *Ans.* ,009462.

4. Divide 34,83645÷1,075. *Ans.* 32,406.

5. Divide 10,8477472÷,7432. *Ans.* 14,596.

6. Divide 67118,985÷84,65. *Ans.* 792,9.

7. Divide 34,6528368÷38,07. *Ans.* ,91024.

8. Divide 23176457,941÷4000,01. *Ans.* 5794,1.

9. Divide ,0000288592914÷,04062. *Ans.* ,00071047.

10. Divide $1002,2454÷$21,06. *Ans.* $47,59.

11. Divide $43,029312976÷$0,47801. *Ans.* $90,0176.

12. Divide 3152,7÷,7006. *Ans.* 4500.

13. Divide 5341,875÷64,75. *Ans.* 82,5.

14. Divide one thousand by one thousandth part of one. *Ans.* 1000000.

15. Divide ,2744 by forty-nine hundredths. *Ans.* Fifty-six hundredths.

16. Divide ,7336 by eight tenths. *Ans.* ,917.

17. If 59,459 gallons of Madeira wine cost $124,982818, what will one gallon cost? *Ans.* $2,102.

18. If 69,25 sides of sole leather cost $391,2625, what cost one side? *Ans.* $5,65.

19. If 749,59 pieces of India crape cost $31489,601269, what is that a piece? *Ans.* $42,0091.

20. Sold 155,75 boxes of cotton balls for $297,4825; How much is that a box? *Ans.* $1,91.

21. Bought 19,5 hundred weight of raisins for $137,7675: What did they cost a hundred weight? *Ans.* $7,065.

22. If 2198,75 yards of tape cost $41,77625, what is that a yard? *Ans.* $0,019.

23. Sold 4,5 dozen of silver cups for $59,13: What was the price of one dozen? *Ans.* $13,14.

24. In 1819, the mail was transported yearly 7574189,25 miles: How far was it transported daily at that rate, allowing the year to contain 365,25 days? *Ans.* 20737 miles.

25. In 1818, the capitals of the Banks in the State of New-York, amounted to $24000000; allowing three-fourths of a million of dollars to each bank, how many banks were there? *Ans.* 32.

FRACTIONS, OR BROKEN NUMBERS.

Q. What are Fractions, or Broken Numbers?

A. Fractions are expressions for any assignable parts of a unit, or whole number.

Q. How are they represented?

A. Fractions are represented by two numbers, placed one directly over the other, with a horizontal line drawn between them, thus, $\frac{1}{4}$ *one-fourth*, $\frac{1}{2}$ *one-half*, $\frac{3}{4}$ *three-fourths*, $\frac{1}{3}$ *one third*, $\frac{2}{3}$ *two thirds*, $\frac{3}{5}$ *three fifths*, $\frac{5}{6}$ *five sixths*, $\frac{1}{7}$ *one seventh*, $\frac{2}{7}$ *two sevenths*, &c. One whole number is equal to 4 quarters, and is also equal to two halves, &c.

Q. What name has each of these figures, and what does it show?

A. The figure below the line is called the Denominator, and shows into how many parts an unit or integer is divided; the figure above the line is called the Numerator, and shows how many of those parts are signified by the fraction.

Illustration.

$\frac{1}{4}$ signifies 1 fourth part.
$\frac{1}{2}$ - 1 half, or 2 fourth parts.
$\frac{3}{4}$ - 3 fourth parts.

ALSO,

$\frac{1}{3}$ signifies 1 third part.
$\frac{2}{3}$ - 2 third parts.
$\frac{1}{5}$ - 1 fifth part.
$\frac{2}{5}$ - 2 fifth parts.
$\frac{3}{5}$ - 3 fifth parts.
$\frac{4}{5}$ - 4 fifth parts.
$\frac{1}{6}$ - 1 sixth part.
$\frac{5}{6}$ - 5 sixth parts.
$\frac{1}{7}$ - 1 seventh part.
$\frac{2}{7}$ - 2 seventh parts.
$\frac{3}{7}$ - 3 seventh parts.
$\frac{4}{7}$ - 4 seventh parts.

$\frac{5}{7}$	signifies	5 seventh parts.
$\frac{6}{7}$	-	6 seventh parts.
$\frac{1}{8}$	-	1 eighth part.
$\frac{3}{8}$	-	3 eighth parts.
$\frac{5}{8}$	-	5 eighth parts.
$\frac{7}{8}$	-	7 eighth parts.
$\frac{1}{9}$	-	1 ninth part.
$\frac{2}{9}$	-	2 ninth parts.
$\frac{4}{9}$	-	4 ninth parts.
$\frac{5}{9}$	-	5 ninth parts.
$\frac{7}{9}$	-	7 ninth parts,
$\frac{8}{9}$	-	8 ninth parts, &c.

NOTE.—In the above illustration, the fractions $\frac{2}{6}$, $\frac{3}{6}$, $\frac{2}{8}$, $\frac{4}{8}$, &c. which would naturally come in with the others, are omitted as not being reduced to their lowest terms.

ADDITION OF FRACTIONS.

CASE I.

RULE.

Q. How do you place the numbers to be added, when the given fractions are all quarters?

A. Call $\frac{1}{4}$ one quarter, $\frac{1}{2}$ two quarters, $\frac{3}{4}$ three quarters; then, if there be fractions *only*, place them in one column, but if there be fractions joined with whole numbers, place them in a column at the right hand of the whole numbers; add them together, and divide their amount by either of the denominators, except that of the $\frac{1}{2}$, and the quotient will be in whole numbers.

EXAMPLES.

NOTE.—The method of proceeding in Addition of Fractions illustrated.

1. What is the amount of $\frac{3}{4}$, $\frac{1}{4}$, $\frac{1}{2}$, and $1\frac{3}{4}$, when added together?

Units.

¾ three quarters.
¼ one quarter.
½ two quarters.
1 ¾ three quarters.

3 ¼ Amount, or answer.

NOTE.—To find the amount of the numbers here given to be added, begin with the ¾ and say, 3 and 2 are 5, and 1 is 6, and 3 are 9 (quarters,) which divide by 4 (quarters,) and it gives a quotient of 2 (whole numbers) and ¼ (one quarter) remains; set down the ¼, and carry the 2 and add to the one, which will make 3; set down the 3, and the answer is then three whole numbers, and one quarter. The reason of dividing the amount of the fractions (quarters) by either of the denominators (except the ½) is, because 4 quarters are equal to one whole number.

2. What is the amount of 2½, 1¼, 3¾, and 4½?
Ans. 12.

3. Find the amount of ¾; ½, ¼, ½, ¾, ¼, ½, ¾, ¼, ½, and ¾?
Ans. 5¾.

4. Give the amount of 3¼, 7¾, 10½, and 19¾?
Ans. 41¼.

5. Add 9½, 1¾, 906½, and 4000¾ together?
Ans. 4918½.

6. The number and depth of snows, &c. which fell from Dec. 30th, 1819, to April 7th, 1820, inclusive, were as follows, viz. Dec. 30th, 1819, 1 snow, 9 inches deep; Jan. 11th, 1820, 1 do. 6 in. do.; 17th, 1 do. 6 in. do.; 19th, 1 do. 2 in. do.; 22d, 1 do. 5½ in. do.; 25th, 1 do. 0½ in. do.; 27th, 1 do. 1 in. do.; 29th, 1 do. 1½ in. do.; 31st, 1 do. 1½ in. do.; Feb. 3d, 1 do. 3½ in. do.; 7th, 1 do. 5 in. do.; 9th, 1 do. 9 in. do.; 11th, 1 do. 16 in. do.; 20th, 1 do. 0½ in. do.; March 2d, 1 do. 3 in. do.; 4th, 1 do. 2 in. do.; 9th, 1 hail, 4 in. do.; 17th, 1 snow, 3 in. do.; April 6th, 1 do. 1 in. do.; 7th, 1 do. 2½ in. do.: What was the number, and also the depth of all the snows, &c.?

Ans. { 20 snows, &c.
{ 82½ inches, total depth.

CASE II.

RULE.

Q. When the fractions are either greater or less than quarters, how do you proceed?

A. Add all the numerators together, and divide their amount by either of the denominators; but in this case, all the denominators belonging to one question must be equal or alike; *i. e.* all thirds, all fifths, all sixths, &c.

EXAMPLES.

1. What is the amount of $\frac{1}{3}$, $\frac{2}{3}$, $4\frac{2}{3}$, $2\frac{1}{3}$, $\frac{2}{3}$, and $5\frac{2}{3}$?

Operation.

$\frac{1}{3}$ one third.
$\frac{2}{3}$ two thirds.
$4\frac{2}{3}$ four and two thirds.
$2\frac{1}{3}$ two and one third.
$\frac{2}{3}$ two thirds.
$5\frac{2}{3}$ five and two thirds.

$14\frac{1}{3}$ Amount, or answer.

NOTE.—To find the amount of the numbers here given to be added, add up all the numerators, and divide their amount by either of the denominators (3,) which will give a quotient of 3 (whole numbers,) and $\frac{1}{3}$ (one third) will remain; set down the $\frac{1}{3}$, and carry the 3 and add to the column of units or whole numbers, the amount of which (being 14,) set down, and the answer is $14\frac{1}{3}$.

2. What is the amount of $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $4\frac{1}{5}$, $6\frac{3}{5}$, $2\frac{4}{5}$, and $14\frac{1}{5}$? *Ans.* $29\frac{4}{5}$.

3. What is the amount of $\frac{1}{6}$, $\frac{2}{6}$, $\frac{3}{6}$, $\frac{4}{6}$, $\frac{5}{6}$, $\frac{4}{6}$, $\frac{1}{6}$, and $\frac{3}{6}$? *Ans.* $3\frac{5}{6}$.

4. What is the amount of $9\frac{4}{7}$, $\frac{1}{7}$, $5\frac{6}{7}$, $\frac{1}{7}$, and $2\frac{3}{7}$? *Ans.* $18\frac{1}{7}$.

5. Give the amount of $\frac{5}{8}$, $\frac{4}{8}$, $\frac{1}{8}$, $\frac{7}{8}$, $\frac{2}{8}$, $\frac{6}{8}$, $\frac{3}{8}$, and $\frac{4}{8}$. *Ans.* 4.

6. Find the amount of $\frac{8}{9}$, $16\frac{2}{9}$, $\frac{5}{9}$, $54\frac{1}{9}$, $7\frac{3}{9}$, $\frac{4}{9}$, $\frac{7}{9}$, and $19\frac{6}{9}$. *Ans.* 100.

7. Add 10, $14\frac{7}{12}$, $\frac{3}{12}$, $\frac{9}{12}$, $1\frac{1}{12}$, $8\frac{10}{12}$, $\frac{2}{12}$, and $\frac{11}{12}$ together. *Ans.* $36\frac{7}{12}$.

8. Give the amount of $\frac{1}{26}$, $\frac{5}{26}$, $\frac{9}{26}$, $\frac{14}{26}$, $\frac{18}{26}$, $\frac{20}{26}$, $\frac{8}{26}$, and $13\frac{25}{26}$. *Ans.* $16\frac{22}{26}$.

SUBTRACTION OF FRACTIONS.

CASE I.

RULE.

Q. How do you place the numbers to be subtracted, when the given fractions are all quarters ?

A. Whether there be fractions only, or fractions joined with whole numbers, call the fractions so many *quarters*, and proceed as in simple subtraction ; unless the lower fraction exceed the upper one, in which case, suppose four quarters to be added to the upper fraction ; from which subtract the lower fraction ; then add *one* to the subtrahend of whole numbers and subtract them.

EXAMPLES.

Note.—The method of proceeding in Subtraction of Fractions illustrated.

1. What is the difference of $514\frac{1}{2}$ subtracted from $607\frac{1}{4}$?

Minuend, 6 0 7 $\frac{1}{4}$ one quarter.
Subtrahend, 5 1 4 $\frac{1}{2}$ two quarters.

Difference, 9 2 $\frac{3}{4}$ Answer.

Note.—To find the difference of the numbers here given to be subtracted, begin with the $\frac{1}{2}$ and say, 2 quarters from 1 quarter I cannot, therefore suppose 4 quarters (equal to one whole number) to be added to the 1 quarter, and it is then equal to 5 quarters ; from which take the 2 quarters, and it leaves a remainder of $\frac{3}{4}$ equal to 3 quarters ; set down the $\frac{3}{4}$ and carry 1 (whole number) and add it to the 4 ; then subtract the whole numbers and the answer will be $92\frac{3}{4}$.

2. From $105\frac{1}{2}$ take $99\frac{3}{4}$.	*Ans.* $5\frac{3}{4}$.
3. Subtract $1\frac{1}{4}$ from $2\frac{3}{4}$.	*Ans.* $1\frac{1}{2}$.
4. Deduct $\frac{1}{2}$ from $\frac{3}{4}$.	*Ans.* $\frac{1}{4}$.
5. From $2094\frac{1}{4}$ take $1885\frac{1}{4}$.	*Ans.* 209.
6. Take $69\frac{1}{2}$ from $70\frac{3}{4}$.	*Ans.* $1\frac{1}{4}$.
7. From $40\frac{3}{4}$ deduct $30\frac{1}{2}$.	*Ans.* $10\frac{1}{4}$.

CASE II.

RULE.

Q. When the fractions are either greater or less than quarters, how do you subtract ?

A. Subtract as in whole numbers; unless the lower fraction exceed the upper one, in which case, suppose as many to be added to the upper fraction as it takes parts of the given fraction to make a whole number; then subtract, and carry one to the whole numbers.

EXAMPLES.

1. From $24\frac{1}{3}$ subtract $12\frac{2}{3}$.

Operation.

Minuend, 2 4 $\frac{1}{3}$ one third.
Subtrahend, 1 2 $\frac{2}{3}$ two thirds.

Difference, 1 1 $\frac{2}{3}$ Answer.

NOTE.—To find the difference of the numbers here given to be subtracted, as 2 thirds cannot be taken from 1 third, suppose 3 thirds to be added to the 1 third which will make 4 thirds; from which, subtract the 2 thirds, and it leaves a remainder of $\frac{2}{3}$ equal to 2 thirds; set down the $\frac{2}{3}$, and carry 1 (whole number) and add it to the 2 in whole numbers; then subtract the whole numbers, and the answer will be $11\frac{2}{3}$.

2. From $19\frac{2}{5}$ take $11\frac{3}{5}$. *Ans.* $7\frac{4}{5}$.

NOTE.—In every question in Case II. all the denominators of the fractions contained in the question, must be equal.

3. From $21\frac{4}{5}$ subtract $12\frac{1}{5}$. *Ans.* $9\frac{3}{5}$.
4. Subtract $48\frac{5}{6}$ from $69\frac{4}{6}$. *Ans.* $20\frac{5}{6}$.
5. Deduct $98\frac{3}{7}$ from $102\frac{2}{7}$. *Ans.* $3\frac{6}{7}$.
6. From $40\frac{3}{9}$ subtract $23\frac{5}{9}$. *Ans.* $16\frac{7}{9}$.
7. From $81\frac{8}{9}$ deduct $30\frac{3}{9}$. *Ans.* $51\frac{5}{9}$.
8. What is the difference of $300\frac{11}{12}$ subtracted from $1000\frac{1}{12}$? *Ans.* $699\frac{2}{12}$.

MULTIPLICATION OF FRACTIONS.

CASE I.

RULE.

Q. How do you proceed, when the fraction is either quarters or halves?

A. Place the whole numbers as in Simple Multiplication and the fraction at the right hand; then if the fraction be contained in the multiplier, divide the multiplicand by it; but if it be contained in the multiplicand, divide the multiplier by it. For ¼ divide by 4 once; for ½ by 2 once; for ¾ by 4 three times; then multiply the whole numbers and add the several parts together, the amount of which, will be the answer.

EXAMPLES.

NOTE.—The method of proceeding in Multiplication of Fractions illustrated.

1. What is the product of 51 multiplied by 6¾.

4)5 1 Multiplicand.
6 ¾ Multiplier.

1 2 ¾ 1st product by ¼.
1 2 ¾ 2d product by ¼.
1 2 ¾ 3d product of ¼.
3 0 6 product by 6.

3 4 4 ¼ Total product or answer.

NOTE.—To find the product of the numbers here given to be multiplied, begin with the ¾ and divide the multiplicand (51) by the denominator (4,) the quotient of which being 12¾, set down as the first product; then divide again twice as before, and multiply the 51 by the 6, and set down all the products; then the amount of the fractions being 9 quarters, divide it by 4 (quarters) which will give 2 (whole numbers) and ¼ (one quarter) remains; set down the ¼ and carry the 2 which add to the column of *units*, and find the amount of the whole numbers.

2. Multiply 51 by 6½. 331½.

NOTE.—In the above sum, the fraction being *one half*, divide the multiplicand by 2, and multiply by the 6.

3. Multiply 97 by 8¼. *Ans.* 800¼.
4. Multiply 68¼ by 39. *Ans.* 2661¾.

NOTE.—In the above sum, divide the multiplier by the ¼.

5. Multiply 45 by 9½. *Ans.* 427½.
6. Multiply 304 by 10¾. *Ans.* 3268.

NOTE.—In the above sum, the easiest way to obtain the answer will be to place the cypher in the multiplier directly under the units in the multiplicand.

7. Multiply 70 by 19¾. *Ans.* 1382½.
8. Multiply 34¾ by 21. *Ans.* 729¾.
9. Multiply 111½ by 101. *Ans.* 11261½.
10. Multiply 29¼ by 19. *Ans.* 555¾.

CASE II.

RULE.

Q. When the fraction is either greater or less than quarters, how do you proceed?

A. Place the numbers and proceed as in Case I.; for $\frac{1}{3}$ divide by 3 once; for $\frac{2}{3}$ by 3 twice; for $\frac{1}{5}$ by 5 once; for $\frac{4}{5}$ by 5 four times; for $\frac{3}{6}$ by 6 three times, &c. dividing by the denominator as many times as the numerator contains parts of a whole number.

EXAMPLES.

1. What is the product of 791 multiplied by $33\frac{2}{3}$?

Operation.

3)7 9 1 Multiplicand.
3 3 $\frac{2}{3}$ Multiplier.

2 6 3 $\frac{2}{3}$ 1st product by $\frac{1}{3}$.
2 6 3 $\frac{2}{3}$ 2d product by $\frac{1}{3}$.
2 3 7 3 product by the units.
2 3 7 3 product by the hunds.

2 6 6 3 0 $\frac{1}{3}$ Total product, or answer.

NOTE.—To find the product of the numbers here given to be multiplied, begin with the $\frac{2}{3}$ and divide the multiplicand by the denominator twice; set down the quotients as the products, and multiply the whole numbers together; then add up all the products, which will give the answer; remembering to divide the amount of the fractions (4 thirds) by either of the denominators (3,) as 3 thirds are equal to 1 whole number.

2. Multiply 95 by $28\frac{4}{5}$. *Ans.* 2736.

NOTE.—In the above sum, as the fraction is $\frac{4}{5}$, divide the multiplicand by the denominator 4 times.

3. Multiply 27 by $14\frac{5}{6}$. *Ans.* $400\frac{3}{6}$.
4. Multiply 801 by $611\frac{1}{3}$. *Ans.* 489678.
5. Multiply 44 by $38\frac{2}{7}$. *Ans.* $1684\frac{4}{7}$.
6. Multiply 63 by $41\frac{8}{9}$. *Ans.* 2639.
7. Multiply $82\frac{3}{8}$ by 29. *Ans.* $2388\frac{7}{8}$.

NOTE.—In the above sum, divide the multiplier three times by the denominator of the fraction.

8. Multiply $156\frac{7}{10}$ by 11. *Ans.* $1723\frac{7}{10}$.

9. Multiply 609 by $207\frac{5}{11}$. *Ans.* $126339\frac{9}{11}$.
10. Multiply $236\frac{1}{13}$ by 48. *Ans.* $11331\frac{9}{13}$.
11. Multiply 9007 by $907\frac{8}{19}$. *Ans.* $8173141\frac{8}{19}$.
12. Multiply $35\frac{3}{24}$ by 34. *Ans.* $1194\frac{6}{24}$.

DIVISION OF FRACTIONS.

CASE I.

RULE.

Q. How do you proceed, when there is a fraction comprised either in the divisor, dividend, or both?

A. If the fraction be quarters, reduce both the divisor and dividend to quarters; but if it be halves, reduce both to halves; then divide, and the quotient will be whole numbers; if there be a remainder, it will be a fractional part of the quotient.

EXAMPLES.

Note.—The method of proceeding in Division of Fractions illustrated.

1. What is the quotient of 92 divided by $6\frac{3}{4}$?

```
Divisor. Dividend. Quotient.
   6 3/4    9 2
   4        4
  ----     -----
   2 7 ) 3 6 8 ( 1 3 17/27
         2 7
         ---
           9 8
           8 1
           ---
           1 7 Remainder.
```

Note.—To find the quotient of the numbers here given to be divided, begin with the divisor, and multiply the whole number (6) by the denominator (4) of the fraction, and add in the numerator (3,) which makes 27 quarters; then multiply the dividend (92) by the same denominator (4) of the fraction, and it makes 368 quarters, which divide by the 27 quarters, and the quotient will be 13 (whole numbers) and 17 will remain, which remainder, place over the divisor at the right hand of the whole numbers, and the answer will be $13\frac{17}{27}$.

2. Divide $729\frac{1}{4}$ by $36\frac{1}{4}$. *Ans.* $20\frac{17}{145}$.

3. Divide $125\frac{1}{4}$ by $29\frac{3}{4}$. *Ans.* $4\frac{25}{119}$.
4. Divide $209\frac{1}{4}$ by 103. *Ans.* $2\frac{13}{412}$.
5. Divide 9843 by $23\frac{1}{2}$. *Ans.* $418\frac{40}{47}$.

Note.—In the above sum, the fraction being halves; reduce both the divisor and dividend to halves, by multiplying them by the denominator of the fraction.

6. Divide $89\frac{1}{2}$ by $15\frac{1}{2}$. *Ans.* $5\frac{24}{31}$.
7. Divide $244\frac{1}{4}$ by 12. *Ans.* $20\frac{17}{48}$.
8. Divide $1260\frac{3}{4}$ by $30\frac{1}{2}$. *Ans.* $41\frac{41}{122}$.

Note.—In the above sum, the fraction in the dividend being $\frac{3}{4}$ (three quarters,) and that in the divisor $\frac{1}{2}$ (one half,) multiply the dividend by 4; then multiply the divisor by 2, and the product thence arising by 2; the last product will be quarters, the same as the dividend.

9. Divide $907\frac{1}{2}$ by $8\frac{1}{4}$. *Ans.* 110.

CASE II.

RULE.

Q. When the fraction is either greater or less than quarters, how do you proceed?

A. Place the numbers and proceed as in Case I.; if the fraction be $\frac{1}{3}$, or $\frac{2}{3}$, reduce both the divisor and dividend to third parts; if it be $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, &c. reduce them to fifth parts; and so for any other fraction, reducing both the divisor and dividend to such parts as the fraction denotes.

EXAMPLES.

1. What is the quotient of $482\frac{2}{3}$ divided by 39?

Operation.

Divisor.	Dividend.	Quotient.
39	$482\frac{2}{3}$	
3	3	
117)	1448	($12\frac{44}{117}$ *Ans.*
	117	
	278	
	234	
	44 Remainder.	

Note.—To find the quotient of the numbers here given to be divided, multiply the dividend by the denominator (3) of the fraction, and add in the numerator (2,) which reduces the dividend to thirds;

then reduce the divisor to thirds (by 3,) and divide as in Case I.; the quotient will then be $12\frac{44}{177}$.

2. Divide $845\frac{1}{5}$ by $26\frac{4}{5}$. *Ans.* $31\frac{72}{134}$.

Note.—In every question in Case II. all the denominators of the fractions contained in the question, must be equal.

3. Divide $40\frac{5}{6}$ by 13. *Ans.* $3\frac{11}{78}$.
4. Divide 385 by $10\frac{2}{7}$. *Ans.* $37\frac{31}{72}$.
5. Divide $106\frac{3}{8}$ by $2\frac{7}{8}$. *Ans.* 37.
6. Divide $402\frac{1}{9}$ by $43\frac{7}{9}$. *Ans.* $9\frac{73}{394}$.
7. Divide $896\frac{8}{10}$ by 4. *Ans.* $224\frac{8}{40}$.
8. Divide 604 by $11\frac{3}{11}$. *Ans.* $53\frac{72}{124}$.
9. Divide $236\frac{12}{13}$ by $48\frac{1}{13}$. *Ans.* $4\frac{580}{625}$.
10. Divide $39\frac{8}{19}$ by 5. *Ans.* $7\frac{84}{95}$.
11. Divide 35 by $34\frac{3}{24}$. *Ans.* $1\frac{21}{819}$.

REDUCTION OF FRACTIONS.

CASE I.

RULE.

Q. What is the process of reducing Fractions to their lowest terms?

A. Divide both terms of the given fraction by any number that will divide them both without a remainder; and continue to divide the quotients, until there is no number greater than one, that will divide them both without a remainder; the last quotient will be the answer.

EXAMPLES.

Note.—The method of proceeding in Reduction of Fractions illustrated.

1. Reduce $\frac{648}{864}$ to its lowest terms.

$$\begin{array}{l} \qquad\quad (4)\quad (3)\quad (2) \\ 9)\frac{648}{864}=\frac{72}{96}=\frac{18}{24}=\frac{6}{8}=\frac{3}{4}\ \text{Answer.} \end{array}$$

Note.—To reduce the numbers here given, first divide the numerator (648) by 9, which gives a quotient of 72; then divide the denominator by the 9, which gives a quotient of 96, making a fraction of $\frac{72}{96}$; again, divide the 72 and 96 by 4, which give quotients making a fraction of $\frac{18}{24}$; again, divide the 18 and 24 by 3, which give quotients making a fraction of $\frac{6}{8}$; lastly, divide the 6 and 8 by 2, which give quotients forming a fraction of $\frac{3}{4}$, the answer required.

2. Reduce $\frac{24}{96}$ to its lowest terms. *Ans.* $\frac{1}{4}$.

NOTE.—To reduce fractions to their lowest terms, divide by *any* number that will divide both the numerator and denominator without a remainder.

3. Reduce $\frac{36}{72}$ to its lowest terms. *Ans.* $\frac{1}{2}$.
4. Reduce $\frac{96}{288}$ to its lowest terms. *Ans.* $\frac{1}{3}$.
5. Reduce $\frac{56}{84}$ to its lowest terms. *Ans.* $\frac{2}{3}$.
6. Reduce $\frac{125}{1000}$ to its lowest terms. *Ans.* $\frac{1}{8}$.
7. Reduce $\frac{75}{100}$ to its lowest terms. *Ans.* $\frac{3}{4}$.
8. Reduce $\frac{3024}{3402}$ to its lowest terms. *Ans.* $\frac{8}{9}$.
9. Reduce $\frac{54}{6750}$ to its lowest terms. *Ans.* $\frac{1}{125}$.
10. Abbreviate $\frac{3008}{8256}$ as much as possible. *Ans.* $\frac{47}{129}$.

CASE II.

RULE.

Q. To reduce a Vulgar Fraction to its equivalent Decimal, how do you proceed?

A. Annex a sufficient number of cyphers to the numerator, and divide by the denominator.

NOTE.

Q. How do you point off, for the cyphers annexed to the numerator?

A. Point off as many places in the quotient, as you annex cyphers to the numerator; but if there be not so many places of figures, make up the deficiency, by prefixing cyphers to the quotient.

EXAMPLES.

1. Reduce $\frac{2}{3}$ to a decimal.

Operation.

Denom. for a divisor. 3)2,00000 Numer. with cyphers annexed, for a divid.

,66666† Answer.

NOTE.—In this sum, 5 cyphers are annexed to the numerator; then the numerator is divided by the denominator, and the quotient is the answer.

NOTE.—This character (†) denotes a remainder, whenever it is placed at the end of an answer.

2. Reduce $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ to decimals. *Ans.* ,25 ,5 ,75.
3. Reduce $\frac{1}{5}$, $\frac{2}{5}$, and $\frac{4}{5}$ to decimals. *Ans.* ,2 ,4 ,8.

4. Reduce $\frac{17}{20}$, and $\frac{12}{480}$ to decimals. *Ans.* ,85 ,025.
5. What is the decimal of $\frac{4}{191}$? *Ans.* ,0209424†.
6. What are the decimals of $\frac{1}{3}$, $\frac{15}{75}$, and $\frac{7}{1250}$?
Ans. ,33333† ,2 ,0056†.
7. What is the decimal of $\frac{9}{1047}$? *Ans.* ,0085959†.
8. What is the decimal of $\frac{1}{29}$? *Ans.* ,034482758†.
9. What is the decimal of $\frac{2}{29}$? *Ans.* ,0689655†.
10. What is the decimal of $\frac{19}{7416}$? *Ans.* ,002562†.

Questions and Exercises in Fractions.

1. What is the amount of one-fourth, one-half, three-fourths, one-half, three-fourths, one-fourth and one-half? *Ans.* $3\frac{1}{2}$.

2. Find the amount of $7\frac{1}{4}$, $12\frac{1}{2}$, $4\frac{1}{4}$ and $10\frac{3}{4}$. *Ans.* Thirty-five.

3. Find the amount of $61\frac{1}{2}$, $209\frac{3}{4}$, $\frac{1}{4}$, $\frac{1}{2}$, $101\frac{3}{4}$ and 5. *Ans.* $378\frac{3}{4}$.

4. What is the difference between three-fourths and one-half? *Ans.* $\frac{1}{4}$.

5. Find the difference between $9\frac{1}{4}$ and four and one-half. *Ans.* $4\frac{3}{4}$.

6. Subtract $99\frac{3}{4}$ from 100 and one-fourth. *Ans.* $\frac{1}{2}$.
7. Multiply 54 by $6\frac{1}{2}$. *Ans.* 351.
8. What is one-fourth of 123? *Ans.* 30 .
9. Multiply $54\frac{1}{6}$ by 12. *Ans.* 650.
10. What is one-ninth of seventy-two? *Ans.* 8.
11. Multiply 27 by $4\frac{3}{4}$. *Ans.* $128\frac{1}{4}$.
12. Multiply $42\frac{5}{8}$ by 10. *Ans.* $426\frac{2}{8}$.
13. Find five-eighths of 960. *Ans.* 600.
14. Find seven-twelfths of 1004. *Ans.* $585\frac{8}{12}$.
15. Divide 57 by 9 and one-half. *Ans.* 6.
16. Divide 216 by 5 and three-fourths. *Ans.* $37\frac{13}{23}$.
17. Divide $120\frac{1}{4}$ by $7\frac{3}{4}$. *Ans.* $15\frac{16}{31}$.
18. Divide $411\frac{1}{9}$ by 14. *Ans.* $29\frac{46}{126}$.

19. Find the amount of one-third, two-thirds, nine and two-thirds, and twenty-four and one-third. *Ans.* 35.

20. What is the difference between twenty and one-third, and nineteen and two-thirds? *Ans.* $\frac{2}{3}$.

21. Divide 113 by 5 and seven-eighths. *Ans.* $19\frac{11}{47}$.
22. Divide $91\frac{3}{4}$ by $11\frac{1}{2}$. *Ans.* $7\frac{45}{46}$.
23. Reduce $\frac{64}{128}$ to its lowest terms. *Ans.* $\frac{1}{2}$.
24. Reduce $\frac{24}{96}$ to its lowest terms. *Ans.* $\frac{1}{4}$.

25. Subtract $16\frac{3}{5}$ from $26\frac{2}{5}$. *Ans.* $9\frac{4}{5}$.
26. Divide $88\frac{17}{19}$ by 14. *Ans.* $6\frac{93}{266}$.
27. What is the amount of $8\frac{4}{7}$, $3\frac{1}{7}$, $\frac{2}{7}$, $\frac{6}{7}$, $\frac{3}{7}$, and $\frac{5}{7}$? *Ans.* Fourteen.
28. Find three-fourths of 507. *Ans.* $380\frac{1}{4}$.
29. What is the quotient of $56\frac{13}{29}$ divided by $8\frac{5}{29}$? *Ans.* $6\frac{215}{237}$.
30. Reduce $\frac{42}{105}$ to its lowest terms. *Ans.* $\frac{2}{5}$.
31. Reduce $\frac{192}{336}$ to its lowest terms. *Ans.* $\frac{4}{7}$.
32. Reduce $\frac{8}{26}$ to a decimal. *Ans.* ,3076923.†
33. Reduce $\frac{4}{7}$ to a decimal. *Ans.* ,57142857.†
34. Abbreviate $\frac{48}{528}$ as much as possible. *Ans.* $\frac{1}{11}$.
35. Abbreviate $\frac{768}{832}$ as much as possible. *Ans.* $\frac{12}{13}$.
36. What is the decimal of $\frac{3}{11}$? *Ans.* ,272727.†

TABLES OF WEIGHTS AND MEASURES.

TROY WEIGHT.

Q. What is the use of Troy Weight?

A. The use of Troy Weight is to weigh gold, silver, jewels, electuaries, and liquors.

TABLE.

24 Grains (grs.) make 1 Penny weight, pwt.
20 Penny weights - 1 Ounce, oz.
12 Ounces - 1 Pound, lb.

NOTE.—A pound Avoirdupois is heavier than a pound Troy; but an ounce Troy is heavier than an ounce Avoirdupois.

175 oz. Troy are equal to 192 oz. Avoirdupois.
175 lb. Troy are equal to 144 lb. Avoirdupois.
5760 Grains = 1 lb. Troy.
7000 Grains = 1 lb. Avoirdupois.
480 Grains = 1 oz. Troy.
$437\frac{1}{2}$ Grains = 1 oz. Avoirdupois.

AVOIRDUPOIS WEIGHT.

Q. What is the use of Avoirdupois Weight?

A. It is to weigh all kinds of coarse and heavy goods, such as tea, sugar, bread, flour, hay, tallow, leather, and all kinds of metals, except gold and silver.

TABLE.

16 Drams (dr.)	make	1 Ounce, oz.
16 Ounces	-	1 Pound, lb.
28 Pounds	-	¼ of a Hund. qr.
4 Quarters	-	1 Hundred, Cwt.
20 Hundred	-	1 Ton, T.

APOTHECARIES WEIGHT.

Q. What is the use of Apothecaries Weight?

A. It is by this weight Apothecaries compound or mix their medicines; but they buy and sell their commodities by Avoirdupois weight.

TABLE.

20 Grains (gr.)	make	1 Scruple, ℈.
3 Scruples	-	1 Dram, ʒ.
8 Drams	-	1 Ounce, ℥.
12 Ounces	-	1 Pound, ℔.

Note.—The Apothecaries' pound and ounce, and the pound and ounce Troy, are the same, only differently divided and subdivided.

WINE MEASURE.

Q. What is the use of Wine Measure?

A. It is to measure brandy, spirits, perry, cider, mead, vinegar, wine, oil, &c.

TABLE.

4 Gills (gl.)	make	1 Pint, pt.
2 Pints	-	1 Quart, qt.
4 Quarts	-	1 Gallon, gal.
63 Gallons	-	1 Hogshead, hhd.
2 Hogsheads	-	1 Pipe, P. or Butt, B.
2 Pipes or Butts	-	1 Tun, T.

ALSO,

10 Gallons	-	1 Anchor, anc.
18 Gallons	-	1 Runlet, run.
31½ Gallons	-	1 Barrel, bar.
42 Gallons	-	1 Tierce, Tier.

Note.—The Wine Gallon contains 231 Cubic inches; and the subdivisions are in the same proportion.

ALE, OR BEER MEASURE.

Q. What is the use of Ale, or Beer Measure ?

A. It is to measure ale, beer, &c.

TABLE.

2 Pints (pt.) make 1 Quart, qt.
4 Quarts - 1 Gallon, gal.
54 Gallons - 1 Hogshead, hhd.
2 Hogsheads - 1 Butt, B.

ALSO,

8 Gallons - 1 Firkin of Ale.
9 Gallons - 1 Firkin of Beer.
18 Gallons - 1 Kilderkin.
36 Gallons - 1 Barrel.
2 Barrels - 1 Puncheon.
3 Barrels - 1 Butt.

Note.—The Beer Gallon contains 282 Cubic inches; and the subdivisions are in the same proportion.

DRY MEASURE.

Q. What is the use of Dry Measure ?

A. It is to measure beans, corn, wheat, seed, fruit, roots, salt, coal, &c.

TABLE.

2 Pints (pt.) make 1 Quart, qt.
4 Quarts - 1 Gallon, gal.
2 Gallons - 1 Peck, pk.
4 Pecks - 1 Bushel, bu.
40 Bushels - 1 Load, lo.

ALSO,

2 Quarts - 1 Pottle.
4 Bushels - 1 Strike.
8 Bushels - 1 Coom.
32 Bushels - 1 Chaldron.
40 Bushels - 1 Wey.
80 Bushels - 1 Last.

Note.—A Bushel is 18½ inches diameter, and 8 inches deep; and contains 2150⅖ Cubic inches. A Gallon, Dry Measure, contains 268⅘ Cubic inches.

CLOTH MEASURE.

Q. What is the use of Cloth Measure?

A. It is to measure all kinds of Piece Goods in the United States.

TABLE.

2¼	Inches, (in.)	make	1	Nail, na.
4	Nails	-	¼	of a yard, yd.
4	Quarters	-	1	Yard, yd.

ALSO,

3	Quarters	-	1	Ell Flemish, E. Fl.
5	Quarters	-	1	Ell English, E. E.
6	Quarters	-	1	Ell French, E. F.
37⅕	Inches	-	1	Ell Scotch, E. S.
33	Inches	-	1	Var. Spanish, V. S.

LONG MEASURE.

Q. What is the use of Long Measure?

A. It is to measure the distance of places where length is considered without regard to breadth.

TABLE.

3	Barley Corns (bc.)	make	1	Inch, in.
12	Inches	-	1	Foot, ft.
16½	Feet	-	1	Rod, rd.
40	Rods	-	1	Furlong, fur.
8	Furlongs	-	1	Mile, m.
69½	Statute Miles	-	1	Degree on the Earth, or of a great Circle.
360	Degrees	-	1	Great Circle, or the Circumference of the Earth.

ALSO,

4	Inches		1	Hand.
3	Feet	-	1	Yard.
5½	Yards	-	1	Rod, Perch, or Pole.
6	Feet	-	1	Fathom.
66	Feet	-	1	Gunter's Chain.
3	Miles	-	1	League.

OR, IN MEASURING DISTANCES.

$7\frac{92}{100}$	Inches	make	1	Link.
25	Links	-	1	Rod.
4	Rods	-	1	Chain.
10	Chains	-	1	Furlong.
8	Furlongs	-	1	Mile.

Note.—The use of a League is to measure distances at Sea. The use of a Hand is to measure Horses. The use of a Fathom is to measure depths. The Rod, Perch, and Pole are equal. Geographers reckon only 60 Miles to a Degree, which makes a Geographic Mile longer than a Statute Mile.

LAND, OR SQUARE MEASURE.

Q. What is the use of Land, or Square Measure.

A. It is to measure all surfaces that have length and breadth ?

TABLE.

144	Square	Inches	make	1	Square Foot.
$272\frac{1}{4}$	-	Feet	-	1	Rod.
40	-	Rods	-	1	Rood.
4	-	Roods	-	1	Acre.

ALSO,

9	-	Feet	-	1	Yard.
$30\frac{1}{4}$	-	Yards	-	1	Rod.
160	-	Rods	-	1	Acre.
640	-	Acres	-	1	Mile.

SOLID, OR CUBIC MEASURE.

Q. What is the use of Solid, or Cubic Measure ?

A. It is to measure all things that have length, breadth, and depth.

TABLE.

1728	Solid Inches	make	1 Solid Foot.
40	Feet of round, or Feet of hewn Timber	-	1 Ton, or Load.
50			

ALSO,

27	Solid Feet	-	1 Solid Yard.
128	- Feet, *i. e.* 8 in length, 4 in breadth and 4 in height.	-	1 Cord of wood.

TIME MEASURE.

Q. What is the use of Time Measure ?
A. It is to mark the progress of the Sun.

TABLE.

60	Seconds (sc.)	make	1	Minute, m.
60	Minutes	-	1	Hour, h.
24	Hours	-	1	Day, d.
365¼	Days	-	1	Year, yr.
100	Years	-	1	Century, cen.

ALSO,

7	Days	-	1	Week, w.
4	Weeks	-	1	Month, mo.
13	Mo. 1 d. 6 h.	-	1	* Julian Year, yr.

Note.—The year is also divided into 12 Calender Months, viz. January, 31d.; February, 28d.; March, 31d.; April, 30d.; May, 31d.; June, 30d.; July, 31d.; August, 31d.; September, 30d.; October, 31d.; November, 30d.; and December, 31 days.

The days of the month may be easily told, after committing the following lines to memory :

Thirty days hath September,
April, June, and November ;
February hath Twenty-eight alone,
And all the rest have Thirty-one.

A Solar day is that space of time which intervenes between the Sun's departing from one Meridian and returning to the same again. A Solar year, according to the best computation, is 365 days, 5 hours, 48 minutes, and 57 seconds.

When you can divide the year of our Lord by 4, without any remainder, it is then Bissextile, or Leap Year, in which February has 29 days, and the year 366 days; but if there be a remainder, that shows the number of years after Leap Year.

CIRCULAR MOTION.

Q. What is understood by Circular Motion ?
A. It is understood as relating to the movements of the Heavenly Bodies.

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* The civil Solar year of 365 days being short of the true by 5h. 48m. 57sc. occasioned the beginning of the year to run forward through the season nearly one day in four years; on this account, Julius Cæsar ordained that one day should be added to February, every fourth year, by causing the 24th day to be reckoned twice ; and because this 24th day was the sixth (sextilis) before the kalends of March, there were, in this year, two of these sextiles, which gave the name of Bissextile to this year, which being thus corrected, was, from thence, called the Julian year.

TABLE.

60 Seconds (") make 1 Prime Minute, ′.
60 Minutes - 1 Degree, °.
30 Degrees - 1 Sign, S.
12 Signs, or
360 Degrees - The great circle of the Zodiac.

PARTICULARS.

12 Single things make 1 Dozen.
12 Dozen - 1 Gross.
12 Gross - 1 Great Gross.

ALSO,

20 Single things make 1 Score.
5 Score - 1 Hundred.

PAPER.

24 Sheets make 1 Quire.
20 Quires - 1 Ream.

Note 1.—Paper is called by the following names, viz. Drawing, Writing, Printing, Sheathing, Wrapping, &c.

Note 2.—The sizes of Paper are designated by the following names, viz. Pot, Foolscap, Letter, Folio-post, Crown, Demy, Medium, Royal, Super-royal, Imperial, Elephant, &c.

PARCHMENT.

12 Skins make 1 Dozen.
5 Dozen - 1 Roll.

BOOKS.

A sheet folded into 2 Leaves, is called Folio.
4 Leaves - Quarto.
8 Leaves - Octavo.
12 Leaves - Duodecimo.

Note.—The smaller books are called 18's, 24's, 32's, 36's, &c. according to the number of leaves in a sheet.

STAVES.

3 Staves make 1 Cast.
40 Casts - 1 Hundred.
10 Hundred - 1 Thousand.

HOOPS.

40	Hoops	make	1 Bundle.
3	Bundles	-	1 Hundred.
10	Hundred	-	1 Thousand.

REFINER'S WEIGHT.

24	Blanks	make	1 Perrot.
20	Perrots	-	1 Mite.
20	Mites	-	1 Grain.

NOTE 1.—The fineness of Gold is tried by fire; if it lose nothing in the trial, it is said to be 24 carats fine.

NOTE 2.—A Carat is the 24th part of any quantity or weight.

NOTE 3.—Silver, which abides the fire without loss, is said to be 12 ounces fine.

COMPOUND ADDITION.

Q. What does Compound Addition teach?

A. Compound Addition teaches to add several numbers together, of the same general nature, having different denominations; as Tons, Hundreds, Quarters; Degrees, Miles, Furlongs, Rods, &c.

RULE.

Q. How do you place the numbers to be added?

A. In Compound Addition, place the several denominations directly under each other, as Pounds under Pounds, Ounces under Ounces, &c.

Q. How do you find the amount?

A. Add up the right hand column, and divide the amount by as many as it takes to make *one* of the next higher denomination; set down the remainder, and carry the quotient to the next column, and so proceed through the whole, setting down the whole amount of the highest denomination as in Simple Addition.

PROOF.

Q. How do you prove Compound Addition?

A. By the same method as Simple Addition.

TROY WEIGHT.

EXAMPLES.

Note.—The method of proceeding in Compound Addition illustrated.

1. What is the amount of the four following numbers?

lb.	*oz.*	*pwt.*	*gr.*
4	12	6	7
16	10	12	22
5	4	13	6
4	11	7	14
32	3	0	1 *Ans.*

Note.—To find the answer or amount of the numbers here given to be added, begin at the bottom of the column of grains, and say, 14 and 6 are 20, and 22 are 42, and 7 are 49, which divide by 24, and it gives 2 pwt. and 1 gr. remains. Set down 1 gr. and carry the 2 pwt. to the column of pwt., and say, 2 to 7 are 9, and 13 are 22, and 12 are 34, and 6 are 40, which divide by 20, and it gives 2 oz. and 0 remains. Set down 0 and carry the 2 oz. to the column of oz., and say, 2 to 11 are 13, and 4 are 17, and 10 are 27, and 12 are 39, which divide by 12, and it gives 3 lb. and 3 oz. remains. Set down the 3 oz., and carry the 3 lb. to the column of lb., and say, 3 to 4 are 7, and 5 are 12, and 16 are 28, and 4 are 32, which set down, and the work is done.

To prove the sum, reckon the figures from the top downwards, and carry for the different denominations as before.

2.

lb.	oz.	pwt.	gr.
24	7	12	14
20	11	19	23
47	4	16	10
19	2	10	6
8	10	1	15
121	1	0	20

3.

lb.	oz.	pwt.	gr.
21	4	9	11
14	10	17	22
7	4	13	7
71	0	1	16
	11	10	0

4.

lb.	oz.	pwt.	gr.
194	11	12	10
740	6	19	8
19	10	0	20
1	0	15	0
	9	6	17

AVOIRDUPOIS WEIGHT.

1.

T.	Cwt.	qr.	lb.	oz.
	14	3	24	15
	19	1	27	10
	11	0	20	11
	9	2	9	13
	1	3	16	8

2.

T.	Cwt.	qr.	lb.	oz.	dr.
	10	2	27	1	11
	15	1	18	10	15
	19	3	7	15	9
	4	0	10	11	1
		2	21	4	12

3.

T.	Cwt.	qr.	lb.	oz.
4	19	2	27	1
2	10	1	18	10
4	18	0	7	15
6	4	3	10	7
	19	2	21	0

APOTHECARIES WEIGHT.

1.

℔	℥	ʒ	℈	gr.
	11	7	1	19
	10	4	2	13
	7	1	1	9
	6	0	2	11
	1	6	0	18

2.

℔	℥	ʒ	℈	gr.
15	10	1	0	10
14	11	7	1	18
54	7	2	2	9
11	1	0	2	13
4	9	7	0	10

3.

℔	℥	ʒ	℈	gr.
211	4	0	2	17
40	11	7	1	19
19	10	5	2	1
8	6	6	0	13
1	0	1	1	0

WINE MEASURE.

1.

P.	hhd.	gal.	qt.	pt.
	1	62	3	1
	1	14	1	1
	1	59	2	0
		40	3	1
		9	0	1

2.

T.	P.	hhd.	gal.	qt.	pt.	gi.
141	1	1	61	2	1	3
96	1	0	17	3	1	0
67	1	1	53	1	1	1
21	0	1	9	2	0	2
99	1	0	1	0	1	3

3.

T.	P.	hhd.	gal.	qt.	pt.	gi.
740	1	1	58	3	1	1
83	0	1	25	2	1	0
68	1	0	43	1	0	3
31	1	1	2	3	1	2
4	0	1	61	2	1	1
1	1	0	0	1	1	3

ALE, OR BEER MEASURE.

1.

B.	hhd.	gal.	qt.	pt.
797	1	51	3	1
160	1	53	1	1
76	1	47	2	0
17	0	19	3	1
2	1	4	0	1

2.

B.	hhd.	gal.	qt.	pt.
75	1	34	3	1
58	1	31	2	0
16	1	10	1	1
30	0	12	0	1
21	1	53	1	1

3.

B.	hhd.	gal.	qt.	pt.
910	1	15	1	0
121	1	44	1	1
85	0	41	0	1
16	1	29	3	1
2	1	1	2	0

DRY MEASURE.

1.

Lo.	bu.	pk.	gal.	qt.	pt.
921	30	3	1	3	1
370	39	1	1	2	0
68	11	2	0	1	1
19	12	3	1	0	1
6	35	1	1	3	1
	29	2	1	1	0

2.

Lo.	bu.	pk.	gal.	qt.	pt.
11	20	2	1	2	0
40	39	3	1	3	1
77	16	1	1	1	1
92	4	3	0	2	1
18	11	2	1	3	1
	26	1	0	1	0

3.

Lo.	bu.	pk.	gal.	qt.	pt.
110	26	3	1	1	1
97	11	1	0	2	1
81	29	2	1	3	1
73	24	3	1	1	0
12	7	1	0	2	1
35	16	2	1	3	1

CLOTH MEASURE.

1.

Yd.	qr.	na.
143	2	1
270	3	2
189	1	0
21	2	3
7	3	2

2.

E. E.	qr.	na.
764	2	3
421	4	2
107	3	1
272	1	0
	4	3

3.

E. Fr.	qr.	na.
327	5	2
142	4	1
768	1	3
114	5	2
9	4	1

4.

E. Fl.	qr.	na.
674	2	3
42	1	1
94	1	0
11	2	2
40	0	3

LONG MEASURE.

1.

Fur.	rd.	ft.	in.	bc.
	31	15	10	2
	24	14	7	1
	17	16	11	0
		7	6	2

2.

Deg.	m.	fur.	rd.
29	64	4	34
72	57	6	24
50	40	7	13
12	16	2	8

3.

Deg.	m.	fur.	rd.	ft.	in.	bc.
54	69	7	39	16	11	1
76	36	7	32	11	4	2
10	15	5	19	9	6	0
21	58	1	8	14	10	2

NOTE.—In the above sums, to carry by 16½ double it, and also double the amount of feet; and half of what remains, after dividing, will be the remainder: Also, to carry by 69½, &c. pursue the same principle.

IN MEASURING DISTANCES.

1.

M.	fur.	ch.	rd.	lk.
1	6	7	1	19
	1	2	2	10
	7	9	3	24
	4	8	2	0

2.

M.	fur.	ch.	rd.	lk.
10	1	3	1	17
14	7	7	0	24
91	4	9	2	13
	2	6	3	10

3.

M.	fur.	ch.	rd.	lk.
94	7	9	3	24
76	6	7	2	21
10	4	2	1	19
42	5	4	0	6

LAND, OR SQUARE MEASURE.

1.

Sq.ft.	sq.in.
19	143
12	127
10	102
21	141

2.

sq.acs.	sq.ro.	sq.rd.
145	3	39
210	1	21
45	2	30
64	0	17

3.

sq.yd.	sq.ft.
15	8
1	7
2	0
10	6

4.

sq.m.	sq.acs.	sq.rd.
604	639	159
746	471	125
312	510	102
529	109	47

SOLID, OR CUBIC MEASURE.

1.

Tons.	ft.	in.
120	39	1727
243	27	1291
109	12	1410
876	20	208
111	4	946

2.

Tons.	ft.	in.
217	49	1721
134	27	1410
90	31	1029
16	14	256
8	20	314

3.

Cords.	ft.	in.
69	127	1219
70	114	1420
44	121	215
35	106	407
11	27	919

TIME MEASURE.

1.

Cen.	yr.	d.	h.	m.	sc.
45	99	360	23	59	59
32	85	365	21	55	40
9	42	104	17	20	18
	1	45	9	6	7

2.

Cen.	yr.	d.	h.	m.	sc.
94	19	101	14	9	42
21	7	20	11	20	10
54	21	17	9	2	0
11	40	99	14	21	4

3.

M.	w.	d.
2	3	6
3	2	4
5	1	5
	3	6

NOTE.—In the above sums, to carry by 365¼, multiply it by 4, and also multiply the amount of the days by 4; and one-fourth of what remains, after dividing, will be the remainder.

CIRCULAR MOTION.

1.

S.	°	′	″
1	29	29	59
1	23	59	40
2	19	35	21
4	7	14	4

2.

S.	°	′	″
2	22	29	42
1	19	57	51
1	20	11	30
4	9	10	9

3.

S.	°	′	″
4	28	58	59
1	21	49	10
1	10	30	41
3	4	17	16

PARTICULARS.

1.

G.gr.	gr.	doz.	s. th.
9	11	10	11
1	7	11	9
2	10	8	10
4	9	11	11
3	6	7	4

2.

Hund	sc.	s. th.
4	4	19
9	3	15
8	2	11
7	1	9
1	4	0

3.

Re'm	qu.	sh.
21	19	23
9	15	21
7	11	10
6	17	18
2	4	9

4.

Thous.	hund.	casts.	staves.
14	9	39	2
9	8	6	0
16	0	24	1
4	5	0	1
	2	38	2

5.

Thous.	hund.	bund.	hoops.
26	9	2	39
11	3	1	4
8	7	0	36
2	0	2	0
	8	1	19

REFINER'S WEIGHT.

1.

Grains	mi.	prts.	blks.
11	19	19	23
2	10	11	19
9	5	17	4
	14	10	17

2.

Grains	mi.	prts.	blks.
9	17	14	13
1	19	4	20
2	7	19	23
4	13	0	10

Questions and Exercises in Compound Addition.

1. A merchant bought at different times, 14 cwt. 1 qr. 21 lb.; 6 cwt. 2 qr. 15 lb.; 1 cwt. 0 qr. 9 lb.; and 4 cwt. 3 qr. 10 lb. of sugar: How much sugar did he buy?
Ans. 1 T. 6 cwt. 3 qr. 27 lb.

2. A tailor bought at different times, 175 yd. 2 na.; 68 yd. 1 na.; 59 yd. 3 na.; and 97 yd. of broadcloth: How many yards did he buy? *Ans.* 399 yd. 1 qr. 2 na.

3. A grocer purchased at several times, 1 hhd. 59 gal. 2 qt.; 62 gal.; 1 hhd. 9 gal. 2 qt.; and 46 gal. of molasses: How much molasses did he purchase?
Ans. 4 hhd. 51 gal.

4. A farmer bought at several times, 275 acrs. 2 ro. 16 rd.; 94 acrs. 1 ro. 30 rd.; 219 acrs. 3 ro. 8 rd.; 50 acrs.; and 105 acrs. 39 rd. of land: How much land did he buy?
Ans. 745 acrs. 0 ro. 13 rd.

5. Harry disposed of wood at sundry times, viz. 79

cords, 120 ft.; 91 cords, 8 ft.; 56 cords, 127 ft.; 247 cords; 64 cords, 34 ft.; and 110 cords, 9 ft.: Of how much wood did Harry dispose? *Ans.* 649 cords, 42 ft.

6. In 1820, the several following gentlemen raised, in the State of New-York, the following quantities of Maize, on one acre of land each, viz. David Taft, of Richfield, 125 bu. 4 qt.; Isaac Lightman, of Laurens, 120 bu. 2 pk.; Dan Smith, of Butternuts, 118 bu. 4 qt.; George H. Derbyshire, of Hartwick, 117 bu.; John Derthick, of Richfield, 111 bu.; Levi Wood, of Middlefield, 95 bu. 4 qt.; and Elias Fitch, of Plainfield, 90 bu. 2 pk. 6 qt.: What was the amount of the whole raised on the 7 acres?

Ans. 777 bu. 2 pk. 2 qt.

7. In 1819, Col. Chapin, of Springfield, (Ms.) had 6 oxen, whose weight was as follows, viz. the largest, 24 cwt. 2 qr.; the 2d, 21 cwt. 2 qr.; the 3d, 19 cwt. 3 qr. 14 lb.; the 4th, 19 cwt. 3 qr.; the 5th and 6th together, 37 cwt.; and in 1817, he had 2 oxen which, when 5 years old, weighed as follows, the largest, 24 cwt. 1 qr.; and the smallest 20 cwt. 2 qr.: What was the weight of the whole? *Ans.* 8 T. 7 cwt. 1 qr. 14 lb.

8. The number of armed vessels taken from Great Britain by the U. S. during the late war, was 358, carrying 3083 guns; besides 1249 vessels without guns, which were tenders, transports, merchantmen, &c.: What was the whole number of vessels taken; and also the number of vessels and guns?

Ans. { 1607 vessels.
4690 vessels and guns.

COMPOUND SUBTRACTION.

Q. What does Compound Subtraction teach?

A. Compound Subtraction teaches to find the difference between any two numbers of the same general nature, having different denominations; as Tons, Hundreds, &c.

RULE.

Q. How do you place the numbers to be subtracted?

A. Place them as in Compound Addition, the largest number uppermost for the Minuend.

Q. How do you find the difference?

A. Begin with the right hand column, subtract the subtrahend from the minuend, and set down the remainder.

Q. How do you proceed when the lower number exceeds the upper one?

A. Suppose as many to be added to the upper number, as it takes to make *one* of the next higher denomination; then subtract the lower number therefrom, and *carry one* and add it to the lower number in the next higher denomination, for that number which was borrowed.

PROOF.

Q. How do you prove Compound Subtraction?

A. By the same method as Simple Subtraction.

TROY WEIGHT.

EXAMPLES.

Note.—The method of proceeding in Compound Subtraction illustrated.

1. What is the difference between 4 lb. 8 oz. 17 pwt. 21 gr. and 3 lb. 7 oz. 19 pwt. 16 gr.?

lb.	oz.	pwt.	gr.	
4	8	17	21	
3	7	19	16	
1	0	18	5	*Ans.*

Note.—To find the difference of the numbers here given to be subtracted, begin with the right hand column, and say, 16 from 21 leave 5 gr., which set down underneath. Proceed to the next column, and say, 19 from 17 I cannot, therefore suppose 20 to be added to 17 which make 37, and say, 19 from 37 leave 18 pwt., which set down; then carry 1 for the *twenty* which were borrowed, and add it to the 7 in the next column, and say, 8 from 8 leave 0 oz., which set down; proceed to the next column, and say, 3 from 4 leave 1 lb., which set down, and the work is done.

To prove the sum, proceed as in Simple Subtraction, and carry for the different denominations as before.

2.

lb.	oz.	pwt.	gr.
4	11	19	23
2	7	14	12
2	4	5	11

3.

lb.	oz.	pwt.	gr.
96	4	13	20
61	4	7	22

4.

lb.	oz.	pwt.	gr.
417	1	7	10
401	10	6	14

AVOIRDUPOIS WEIGHT.

1.

T.	cwt.	qr.	lb.	oz.
24	4	3	20	14
23	17	2	21	15

2.

T.	cwt.	qr.	lb.	oz.
1	0	3	11	12
	13	0	21	11

3.

cwt.	qr.	lb.	oz.	dr.
19	2	12	4	10
10	0	20	7	15

APOTHECARIES WEIGHT.

1.

℔	℥	ʒ	℈	gr.
91	4	7	0	19
	5	0	1	0

2.

℔	℥	ʒ	℈	gr.
1	10	0	2	11
	10	6	1	19

3.

℔	℥	ʒ	℈	gr.
143	0	1	1	0
79	0	4	1	1

WINE MEASURE.

1.

P.	hhd.	gal.	qt.	pt.
1	1	43	2	1
	0	61	3	1

2.

T.	P.	hhd.	gal.	qt.	pt.
20	0	1	27	2	1
19	1	0	42	3	1

3.

T.	P.	hhd	gal.	qt.	pt.
40	1	0	62	1	0
21	0	1	40	2	1

ALE, OR BEER MEASURE.

1.

B.	hhd	gal.	qt.	pt.
12	1	41	3	1
12	0	53	2	1

2.

B.	hhd	gal.	qt.	pt.
19	0	53	1	0
18	1	33	2	1

3.

B.	hhd	gal.	qt.	pt.
124	0	9	0	1
40	0	50	3	0

DRY MEASURE.

1.

Lo.	bu.	pk.	gal.	qt.	pt.
21	39	3	1	2	1
19	20	2	0	3	1

2.

Lo.	bu.	pk.	gal.	qt.	pt.
10	19	0	0	1	0
9	21	1	1	2	1

3.

Lo.	bu.	pk.	gal.	qt.	pt.
4	0	2	0	0	1
3	19	1	0	1	0

CLOTH MEASURE.

1.

Yds.	qr.	na.
421	1	2
290	1	3

2.

E. E.	qr.	na.
647	2	0
597	0	2

3.

E.Fr.	qr.	na.
215	3	1
207	4	2

4.

E.Fl.	qr.	na.
74	1	0
51	1	3

LONG MEASURE.

1.

Rd.	ft.	in.	bc.
34	13	10	1
26	14	10	2

2.

Deg.	m.	fur.	rd.
51	41	6	27
4	67	5	39

3.

Deg.	m.	fur.	rd.	ft.	in.	bc.
6	15	0	31	7	8	1
2	41	6	32	11	9	2

Note.—In the above sums, to borrow from 16$\frac{1}{2}$, 69$\frac{1}{2}$, &c.; after subtracting, carry the $\frac{1}{2}$ back, and add it to the next lower denomination; from thence, set down and carry as at first.

IN MEASURING DISTANCES

1.

M.	fur.	ch.	rd.	lk.
72	4	6	2	24
71	4	7	3	15

2.

M.	fur.	ch.	rd.	lk.
185	7	0	1	9
90	6	9	0	21

3.

M.	fur.	ch.	rd.	lk.
16	2	7	2	17
	5	8	1	19

LAND, OR SQUARE MEASURE.

1.

Sq.A.	sq.ro.	sq.rd.	sq. ft.	sq. in.
1	3	36	264	143
1	1	37	227	119

2.

Sq.A.	sq.ro.	sq.rd.	sq. ft.	sq. in.
4	1	21	216	124
2	1	32	241	142

3.

Sq.A.	sq.ro.	sq.rd.
470	2	39
382	3	17

SOLID, OR CUBIC MEASURE.

1.

Tons.	ft.	in.
213	21	1701
107	37	1726

2.

Tons.	ft.	in.
145	47	490
127	48	979

3.

Cords.	ft.	in.
471	96	76
390	109	999

TIME MEASURE.

1.

Mo.	w.	d.
12	2	4
10	2	6

2.

Cen.	yr.	d.	h.	m.	sc.
9	71	217	19	42	19
8	98	361	20	51	27

3.

Cen.	yr.	d.	h.	m.	sc.
20	99	148	23	17	52
20	40	362	9	31	59

Note.—In the above sums, to borrow from 365¼; after subtracting, carry the ¼ back and add it to the next lower denomination; from thence, set down and carry as at first.

CIRCULAR MOTION.

1.

S.	°	′	″
12	14	41	56
6	27	49	57

2.

S.	°	′	″
10	24	14	51
8	17	37	40

3.

S.	°	′	″
7	4	7	6
6	19	10	16

PARTICULARS.

1.

G. gr.	gr.	doz.	s. th.
74	4	7	6
34	9	10	8

2.

Hund	sc.	s. th.
97	4	13
48	3	18

3.

Re'm	qr.	sh.
47	16	17
34	16	21

4.

G. gr.	gr.	doz.	s. th.
91	4	7	8
67	8	7	9

REFINER'S WEIGHT.

1.				2.				3.			
Grs.	mi.	prts.	blks.	Grs.	mi.	prts.	blks.	Grs.	mi.	prts.	blks.
16	8	7	21	9	12	17	14	10	4	18	0
14	9	17	23	1	17	18	19	9	10	18	1

Questions and Exercises in Compound Subtraction.

1. Two men can do a job of work in 11 mo. 1 wk. 4 d.; and one of them works 9 mo. 0 wk. 6 d.: How long must the other man work to complete the job?
Ans. 2 mo. 0 wk. 5 d.

2. A grocer purchased 9 B. 1 hhd. 47 gal. of strong beer, and disposed of 7 B. 0 hhd. 53 gal.: How much had he remaining? *Ans.* 2 B. 0 hhd. 48 gal.

3. A farmer has on hand twenty-seven Loads and thirty-four bushels of wheat; should he sell nineteen Loads, ten bushels, and three pecks, how much would remain unsold? *Ans.* 8 Lo. 23 bu. 1 pk.

4. A horse was to run a race of 3 Miles, 2 fur. 1 ch. 2 rd.; but by some accident, stopped the distance of 5 fur. 2 ch. before reaching the end of the race: How far did he run? *Ans.* 2 M. 4 fur. 9 ch. 2 rd.

5. Mr. Belzoni, a Roman traveller, recently discovered in one of the Egyptian catacombs, at Thebes, an exquisitely beautiful sarcophagus of Alabaster, sounding like a bell, and transparent as glass, 9 ft. 5 in. long, 3 ft. 9 in. wide, and 2 ft. 1 in. high; and on opening the second pyramid of Ghiza, he found a sarcophagus of granite 8 ft. long, 3 ft. 6 in. wide, and 2 ft. 3 in. deep: What was the difference of their amounts in feet and inches?
Ans. 1 ft. 6 in.

Note.—In the above sum, add together the length, breadth, and depth of each separately; then subtract the contents of the one from the contents of the other.

COMPOUND MULTIPLICATION.

Q. What does Compound Multiplication teach?

A. Compound Multiplication teaches, by having the weight or measure of one article given to find the weight or measure of several articles; and is very useful in finding the quantity or amount of goods.

CASE I.

RULE.

Q. When the multiplier does not exceed twelve, how do you place the numbers to be multiplied?

A. Place the multiplier directly under the lowest denomination of the multiplicand.

Q. How do you find the product?

A. Multiply each denomination in the multiplicand by the multiplier; and carry as in Compound Addition.

PROOF.

Q. How do you prove Compound Multiplication?

A. Divide the product by the multiplier, and the quotient will be equal to the given sum.

EXAMPLES.

NOTE.—The method of proceeding in Compound Multiplication illustrated.

1. What is the product of 6 hhd. 39 gal. 2 qt. of wine, multiplied by 7?

	hhd.	gal.	qt.	
	6	39	2	
			7	
7)	46	24	2	*Ans.*
	6	39	2	Proof.

NOTE.—To find the product of the numbers here given to be multiplied, begin with the multiplier, and say, 7 times 2 are 14, which divide by 4, and it gives 3 gal. and 2 qt. over. Set down the 2 qt. underneath and carry the 3 gal.; then 39 multiplied by 7 gives 273, to which add the 3 carried, and it makes 276, which divide by 63, and it gives 4 hhd. and 24 gal. over. Set down the 24 gal. underneath, and carry the 4 hhd.; then say, 7 times 6 are 42, to which add the 4 carried, and it makes 46 hhd., which set down, and the work is done.

To prove the work, divide the 46 hhd. by the multiplier (7,) which gives 6 for a quotient, and 4 over. Set down the 6, and multiply the 4 by 63, and it gives 252 gal., to which add the 24 gal., and it makes 276 gal., which divide by 7, and it gives 39 for a quotient, and 3 over. Set down the 39, and multiply the 3 by 4, and it gives 12 qt., to which add the 2 qt. and it makes 14 qt., which divide by 7, and it gives 2 for a quotient, which set down, and the work is proved.

2.

Yd.	qr.	na.
4	3	2
		4

3.

T.	cwt.	qr.	lb.	oz.	dr.
1	12	1	24	13	9
					5

4.

T.	P.	hhd.	gal.	qt.	pt.	gl.
2	1	1	61	3	1	3
						6

5. Multiply 8 m. 4 fur. 7 ch. 3 rd. 24 lk. by 7.
Ans. 60 m. 1 fur. 5 ch. 3 rd. 18 lk.

6. Multiply 4 Cen. 99 yr. 361 d. 22 h. 57 m. 42 sc. by 8.
Ans. 39 Cen. 99 yr. 338 d. 21 h. 41 m. 36 sc.

7. Multiply 7 ℔. 10 ℥. 7 ʒ. 2 ℈. 19 gr. by 9.
Ans. 71 ℔. 2 ℥. 7 ʒ. 2 ℈. 11 gr.

8. Multiply 1 deg 67 m. 4 fur. 32 rd. 15 ft. 10 in. 2 bc. by 10. *Ans*. 19 deg. 50 m. 4 fur. 9 rd. 10 ft. 4 in. 2 bc.

9. Multiply 16 lb. 9 oz. 19 pwt. 23 gr. by 11.
Ans. 185 lb. 1 oz. 19 pwt. 13 gr.

10. What is the product of 7 Gr. 17 m. 14 prts. 23 blks. multiplied by 12? *Ans*. 94 gr. 12 mi. 19 prts. 12 blks.

11. Multiply 1 B. 0 hhd. 46 gal. 1 qt. 0¼ pt. of beer, by 7. *Ans*. 9 B. 1 hhd. 53 gal. 3 qt. 1 pt.

12. Multiply 24 ac. 2 ro. 39 rd. by 8.
Ans. 197 ac. 3 ro. 32 rd.

13. Multiply 1 S. 2° 32′ 42″ by 11.
Ans. 11 S. 27° 59′ 42″.

14. Multiply 66 yr. 243 d. 11 h. 29 m. 15 sc. by 12.
Ans. 7 Cen. 99 yr. 364 d. 23 h. 51 m.

CASE II.

RULE.

Q. When the multiplier exceeds twelve, how do you proceed?

A. When the multiplier exceeds 12, multiply by a composite number; *i. e.* multiply each denomination in the multiplicand by one of two such numbers, as when multiplied together, will produce the given quantity; and that product by the other number, and the last product will be the answer.

PROOF.

Q. How do you prove Compound Multiplication in Case II.?

A. Divide the last product by the *last* multiplier; then divide the quotient thence arising, by the *first* multiplier.

EXAMPLES.

1. What is the product of 1 yd. 2 qr. 3 na. multiplied by 20?

Operation.

Yd. qr. na.
1 2 3 Multiplicand.
4 One of the component parts.
4×5=20 ———
6 3 0 Product of the multiplicand, multiplied [by 4.
5 The other component part.
———
5) 33 3 0 Product of the multiplicand multiplied by 5 times 4, or answer.
———
4) 6 3 0 Quotient of the product, divided by 5.
———
1 2 3 Proof, or quotient of the *first* quotient, divided by 4.
———

NOTE.—To find the product of the numbers here given to be multiplied, consider first what two numbers multiplied together will produce 20, i. e. what the component parts of 20 are; they being ascertained to be 4 and 5, (4 times 5 are 20,) first multiply each figure in the multiplicand by the 4, the product of which, set down below the multiplier (4;) then multiply each figure in that product (obtained by 4) by the 5, the product of which, set down below the multiplier (5,) and it will be the total product, or answer.

To prove the work, first divide the total product or answer by the last multiplier (5;) and then the quotient thence arising by the first multiplier (4:) the last quotient, (if the work be right,) will be equal to the multiplicand.

2.

M.	fur.	ch.	rd.	lk.
7	7	8	2	23
				4
31	7	4	3	17
				9

3.

Da.	hr.	m.	sc.
4	23	56	42
			7
34	23	36	54
			8

4.

Lo.	bu.	pk.	gal.	qt.	pt.
2	39	3	1	2	1
					3
8	39	3	0	3	1
					9

Note.—In the above sums, I have not multiplied by the *last component part*, but left it for the exercise of the pupil.

5. Multiply 10 gr. 9 doz. 11 s. th. by 35.
Ans. 31 G. gr. 6 gr. 11 doz. 1 s. th.

6. Multiply 1 M. 637 ac. 159 rd. by 48.
Ans. 95 M. 543 ac. 112 rd.

7. Multiply 175 Cds. 126 ft. 1721 in. by 54.
Ans. 9503 Cds. 73 ft. 1350 in.

8. Multiply 2° 37′ 59″ by 72.
Ans. 6 S. 9° 34′ 48″.

9. Multiply 1 qr. 2 na. of cambric by 18.
Ans. 6 yd. 3 qr.

10. Twenty-four persons receive 1 lb. 3 oz. 19 pwt. 20 gr. each: How much do they all receive?
Ans. 31 lb. 11 oz. 16 pwt.

11. A. bought 35 chests of tea, which contained 1 cwt. 1 qr. 13 lb. 9 oz. each: What was the weight of the whole? *Ans.* 47 cwt. 3 qr. 26 lb. 11 oz.

12. A jeweller bought 42 packs of gold-leaf, each containing 1 lb. 2 oz. 10 pwt. 22 gr.: How much did they all contain? *Ans.* 50 lb. 10 oz. 18 pwt. 12 gr.

13. In 63 pieces of cassimeres, each measuring 84 yd. 1 qr. 3 na., how many yards? *Ans.* 5319 yd. 2 qr. 1 na.

14. In 88 pieces of land, each containing 1 ac. 32 rd., how many acres? *Ans.* 105 ac. 2 ro. 16 rd.

15. What is the weight of 111 bags of coffee, each weighing 1 cwt. 3 qr. 19 lb.
Ans. 10 T. 13 cwt. 0 qr. 9 lb.

Note.—In the above sum, the number of bags being 111, and the product of the *component parts* 110, first find the weight of 110 bags; then add thereto, the weight of 1 bag, and you will have the weight of the whole.

16. Seventy-four men purchased, in company, 97 ac.

37 rd. of uncultivated land each: How much land did they all purchase together? *Ans.* 7195 ac. 0 ro. 18 rd.

17. What is the weight of 16 packages of medicine, each weighing 2 ℔. 6 ℥. 5 ʒ. 2 ℈. 19 gr.?

Ans. 40 ℔. 11 ℥. 7 ʒ. 2 ℈. 4 gr.

18. In a wall 20 ft. long, 10 ft. high, and 5 ft. thick, how many solid feet? *Ans.* 1000 ft.

Note.—In the above sum, multiply the length by the height, and that product by the thickness.

19. In 144 Pipes of beer, each containing 1 hhd. 53 gal. 1 qt., how much beer? *Ans.* 286 hhd.

20. How much wine in 64 Pipes, each containing 1 hhd. 62 gal. 2 qt.? *Ans.* 31 tuns, 1 P. 1 hhd. 31 gal.

21. A ship sailed at the rate of 1 deg. 59 m. 44 sc. each day, for 20 days: How far did she sail in that time?

Ans. 39 deg. 54 m. 40 sc.

CASE III.

Where the shares of partners are equal.

EXAMPLES.

1. A man divided a piece of land equally among his seven sons, giving each 94 Ac. 3 ro. 26 rd.: How much land did they all receive together? *Ans.* 664 ac. 1 ro. 22 rd.

2. A man died, leaving to his widow and six children, five building lots each, and each lot contained 12 square rods: What was the whole number of acres.

Ans. 2 ac. 100 rd.

3. A prize consisting of cotton, worth $5000, (the captain being lost,) is to be equally divided among 29 sailors; each sailor receives 17 cwt. 3 qr. 27 lb. of cotton: How much do they all receive? *Ans.* 26 tons, 1 cwt. 2 qr. 27 lb.

CASE IV.

Where the shares of partners are unequal.

EXAMPLES.

1. A privateer takes a prize consisting of coffee, which is divided in the following manner, viz., the captain receives one half, and the sailors, being 13, receive each 49 cwt. 10 lb. of coffee: Of how much coffee did the prize consist? *Ans.* 63 tons, 16 cwt. 1 qr. 8 lb.

Note.—In the above sum, first find the whole amount of coffee received by the sailors, and add the captain's share to it.

2. A tract of land was divided between 3 men, 2 women, and 7 boys; each boy received 54 ac. 1 ro. 13 rd., each woman received double to a boy, and each man double to a woman: How much did they all receive? *Ans.* 1249 ac. 2 ro. 19 rd.

Note.—In the above sum, first find the amount of land received by the boys, then that received by the women, and also that received by the men; then add them together.

3. A. bought 9 hhd. 47 gal. 3 qt. of molasses, B. three times as much, and C. four times as much as B.: How much did they all buy together? *Ans.* 156 hhd. 8 gal.

4. A privateer took a prize consisting of salt, which was divided in the following manner, viz. the owners received one half, the officers one fourth, and the remainder was divided equally among 136 sailors; each sailor received 24 bu.: Of how much salt did the prize consist? *Ans.* 13056 bu.

Questions and Exercises in Compound Multiplication.

1. On an average of 4 years, ending March, 1815, the quantity of coals imported into London, amounted to 1170000 chaldrons annually: How many chaldrons were imported into London during the 4 years? *Ans.* 4680000 chaldrons.

2. In 1820, there were, in the State of Connecticut, more than 60 cotton manufacturing establishments, (containing 50000 spindles,) which cost $1500000; and were capable of manufacturing 9960000 yards of common shirting, and other goods of like quality, annually; of employing 10000 persons, exclusive of weavers; of paying out $850000 for labour: How many yards could be manufactured, at that rate, in 9 years? *Ans.* 89640000 yards.

3. In the above year, and in the same State, there were 36 woollen manufactories, (exclusive of 500 clothier's shops,) which were worth $400000; and were capable of producing goods to the value of $40000 annually; would work 160000 lbs. of wool, and pay $280000 for labour: How much wool would they work up in 18 years, at that rate? *Ans.* 2880000 lbs.

4. Congress permitted the ports of South-Carolina to be opened to the importation of slaves for the term of 4 years, ending Dec. 31st, 1807; during which time, there

were, on an average, 9769 slaves imported annually: How many were imported during the above period of time? *Ans.* 39076.

COMPOUND DIVISION.

Q. What does Compound Division teach?

A. Compound Division teaches to find how many times any simple number is contained in another, composed of different denominations.

CASE I.

RULE.

Q. When the divisor does not exceed twelve, how do you place the numbers to be divided?

A. When the divisor is under 12, set down the dividend, and place the divisor at the left hand of it.

Q. How do you find the quotient?

A. To find the quotient, divide each denomination in the dividend by the divisor; always remembering, whenever there is a remainder in either of the denominations, to reduce it to the next less, and add in those of the same name.

PROOF.

Q. How do you prove Compound Division?

A. To prove Compound Division, multiply the quotient by the divisor, and the product will be equal to the given sum.

EXAMPLES.

Note.—The method of proceeding in Compound Division illustrated.

1. What is the quotient of 46 hhd. 24 gal. 2 qt. of rum, divided by 7?

	Hhd.	gal.	qt.	
7)	46	24	2	
	6	39	2	Ans.
			7	
	46	24	2	Proof.

NOTE.—To find the quotient of the numbers here given to be divided, begin with the divisor, and say, 7 in 46, 6 times, and 4 hhd. remain. Set down the 6, and multiply the 4 hhd. by 63, and it makes 252 gal., to which, add the 24 gal., and it makes 276 gal.; then 7 in 276, is contained 39 times, and 3 gal. remain. Set down the 39, and multiply the 3 gal. by 4, and it makes 12 qt.; to which add the 2 qt. and it makes 14 qt.; then 7 in 14, is contained 2 times, which set down and the work is done.

To prove the work, multiply the 2 qt. by the divisor (7,) and it gives 14 for a product, which divide by 4, and it gives 3 gal. and 2 qt. remain. Set down the 2 qt. and carry the 3 gal.; then 39 multiplied by 7 gives 273, to which add the 3 carried, and it makes 276, which divide by 63, and it gives 4 hhd., and 24 gal. remain. Set down the 24 gal., and carry the 4 hhd.; then say, 7 times 6 are 42, to which add the 4 carried, and it makes 46 hhd., which set down, and the work is done.

2.

	Yd.	qr.	na.
4)	4	3	2

3.

	T.	cwt.	qr.	lb.	oz.	dr.
5)	1	12	1	24	13	9

4.

	T.	P.	hhd.	gal.	qt.	pt.	gi.
6)	2	1	1	61	3	1	3

5. Divide 60 M. 1 fur. 5 ch. 3 rd. 18 lk. by 7.
Ans. 8 M. 4 fur. 7 ch. 3 rd. 24 lk.

6. Divide 39 Cen. 99 yr. 338 d. 21 h. 41 m. 36 sc. by 8.
Ans. 4 Cen. 99 yr. 361 d. 22 h. 47 m. 42 sc.

7. Divide 71 ℔. 2 ℥. 7 ʒ. 2 ℈. 11 gr. by 9.
Ans. 7 ℔. 10 ℥. 7 ʒ. 2 ℈. 19 gr.

8. Divide 19 deg. 50 m. 4 fur. 9 rd. 10 ft. 4 in. 2 bc. by 10.
Ans. 1 deg. 67 m. 4 fur. 32 rd. 15 ft. 10 in. 2 bc.

9. Divide 185 lb. 1 oz. 19 pwt. 13 gr. by 11.
Ans. 16 lb. 9 oz. 19 pwt. 23 gr.

10. What is the quotient of 94 gr. 12 mi. 19 prts. 12 blks. divided by 12? *Ans.* 7 gr. 17 mi. 14 prts. 23 blks.

11. Divide 9 B. 1 hhd. 53 gal. 3 qt. 1 pt. of beer, by 7. *Ans.* 1 B. 0 hhd. 46 gal. 1 qt. 0¼ pt.

12. Divide 197 ac. 3 ro. 32 rd. by 8.
Ans. 24 ac. 2 ro. 39 rd.

13. Divide 11 S. 27° 59′ 42″ by 11.
Ans. 1 S. 2° 32′ 42″.

14. Divide 7 Cen. 99 yr. 364 d. 23 h. 51 m. by 12.
Ans. 66 yr. 243 d. 11 h. 29 m. 15 sc.

CASE II.

RULE.

Q. When the divisor exceeds twelve, how do you proceed?

A. When the divisor exceeds twelve, divide by a composite number; *i. e.* divide each denomination in the dividend by one of the component parts, and the quotient thence arising by the other, the last quotient will be the answer.

PROOF.

Q. How do you prove compound division in Case II.?

A. Multiply the last quotient by the *last* divisor; then multiply the product thence arising, by the *first* divisor.

EXAMPLES.

1. What is the quotient of 33 yd. 3 qr. divided by 20?

Operation.

5×4=20.

	yd.	qr.	na.	
5)	33	3		Dividend,
4)	6	3		Quotient of the dividend divided by 5.
	1	2	3	Quo. of the *first* quo. divided by 4.
			4	One of the component parts.
	6	3	0	Prod. of the quo. multiplied by 4.
			5	Other component part.
	33	3	0	Proof, or product of the *first* product, multiplied by 5.

NOTE.—To find the quotient of the numbers here given to be divided, first divide the 33 by 5, (one of the component parts,) which gives 6 for a quotient, and 3 yd. remain. Set down the 6, and multiply the 3 yd. remainder by 4, and to the product, add the 3 qr. and it makes 15, the quotient of which is 3, and nothing remains. Set down the 3; then divide the 6 by the 4, (the other component part,) which gives 1 for a quotient and 2 yd. remain. Set down the 1 and multiply the 2 yd. remainder by 4, and to the product, add the 3 qr. and it makes 11, the quotient of which is 2, and 3 qr. remain. Set down the 2, and multiply the 3 qr. remainder by 4, and it makes 12, the quotient of which is 3, which set down, and the work is done.

To prove the work, first multiply the last quotient or answer by the *last* divisor (4;) and then the product thence arising by the *first* divisor (5:) the last product, (if the work be right,) will be equal to the dividend.

2.

	M.	fur.	ch.	rd.	lk.
9)	287	3	4	1	3
4)	31	7	4	3	17

3.

	Da.	hr.	m.	sc.
8)	279	20	55	12
7)	34	23	36	54

4.

	Lo.	bu.	pk.	gal.	qt.	pt.
9)	80	88	2	1	3	1
3)	8	39	3	0	3	1

NOTE.—In the above sums, I have not divided by the *last component part,* but left it for the exercise of the pupil.

5. Divide 31 G. gr. 6 gr. 11 doz. 1 s.th. by 35.
Ans. 10 gr. 9 doz. 11 s.th.

6. Divide 95 M. 543 ac. 112 rd. by 48.
Ans. 1 M. 637 ac. 159 rd.

7. Divide 9503 Cds. 73 ft. 1350 in. by 54.
Ans. 175 Cds. 126 ft. 1721 in.

8. Divide 6 S. 9° 34′ 48″ by 72. *Ans.* 2° 37′ 59″.

9. Divide 6 yd. 3 qr. of cambric by 18.
Ans. 1 qr. 2 na.

10. Twenty-four persons receive, (equally alike,) 31 lb. 11 oz. 16 pwt.: How much does each person receive?
Ans. 1 lb. 3 oz. 19 pwt. 20 gr.

11. A. bought 35 chests of tea which contained 47 cwt. 3 qr. 26 lb. 11 oz.; What was the weight of each?
Ans. 1 cwt. 1 qr. 13 lb. 9 oz.

12. A jeweller bought 42 packs of gold-leaf containing 50 lb. 10 oz. 18 pwt. 12 gr.: How much did each pack contain? *Ans.* 1 lb. 2 oz. 10 pwt. 22 gr.

13. In 63 pieces of cassimeres, measuring 5319 yd. 2 qr. 1 na.: How many yards in each piece?
Ans. 84 yd. 1 qr. 3 na.

14. In 88 pieces of land, containing 105 ac. 2 ro. 16 rd.: How many acres in each piece?
Ans. 1 ac. 0 ro. 32 rd.

CASE III.

RULE.

Q. When the divisor is such a number, as cannot be produced by the multiplication of small numbers, how do you proceed?

A. Divide after the manner of long division, setting down the work of dividing and reducing.

PROOF.

Q. How do you prove compound division in Case III. ?
A. Multiply the quotient by the divisor.

EXAMPLES.

1. Seventy-three men purchased, in company, 7195 ac. 0 ro. 18 rd. of uncultivated land: How much land did each man purchase on an average ?

Operation.

```
        Ac.  ro. rd. Ac. ro. rd.
    73)7195  0  18(98  2  10 8/73 Ans.
       657                73
       ----        -----------
        625        7195  0  18 Proof.
        584        -----------
        ----
         41
          4
        ----
    73) 164(2 ro.
        146
        ----
         18
          40
        ----
     73) 738(10 8/73 rd.
         73
        ----
          8 Remainder.
        ----
```

NOTE.—To find the quotient of the numbers here given to be divided, first divide the 719 by the 73, and it gives 9 for the first quotient figure, which set down at the right hand of the dividend. Then multiply the divisor by it, and set down the product under the 719, from which subtract, and there remains 62, to which bring down the next figure (5,) and it makes 625. The next quotient figure being found to be 8, set it to the right hand of the 9, and it makes 98 ac. Then multiply by the 8, and subtract as before, and it leaves a remainder of 41, which multiply by 4, and it gives 164, which divide by 73, and it gives 2 ro., and 18 over. Set down the 2 ro. to the right hand of the 164; then multiply the 18 by 40, and add in the 18 rd. in the given sum, which makes 738; then say, 73 in the first two figures (73,) once, which I set down at the right hand of the 738; then multiply and subtract as before, and it leaves 0 remainder. Lastly, bring down the 8; then, as 73 cannot be contained in it, place a 0 to the right hand of the 1, which makes it 10; then place the 8 and 73 for a fraction, to the right hand of the 10, and it is $10\frac{8}{73}$ rd. Then place the 2 ro. and $10\frac{8}{73}$ rd. to the right hand of the 98 ac., and the answer is completed.

To prove the work, multiply the 10 rd. by the divisor (73,) and add in the numerator (8) of the fraction, which makes 738, which divided by 40, gives 18 ro., and 18 rd. remain. Set down the latter, and carry the former; then multiply the 2 ro. and add in the 18 ro. which makes 164. Divide it by 4, and it gives 41 ac. and 0 ro. Set down the 0 ro. and carry the 41 ac.; lastly, multiply the 98 ac. and to the product add the 41, which makes 7196 ac. and the work is proved.

2. If the weight of 17 packages of medicine be 40 ℔. 10 ℥. 7 ʒ. 2 ℈. 11 gr., what is the weight of each package? *Ans.* 2 ℔. 4 ℥. 7 ʒ. 0 ℈. 3 gr.

3. If 61 Pipes of wine contain 31 tuns, 1 P. 1 hhd. 60 gal. 3 qt. 0 pt. 3 gl., how much does each Pipe contain? *Ans.* 1 P. 0 hhd. 6 gal. 0 qt. 1 pt. $1\frac{12}{61}$ gl.

4. If 111 bags of coffee weigh 10 T. 13 cwt. 0 qr. 9 lb., what is the weight of each? *Ans.* 1 cwt. 3 qr. 19 lb.

5. If 144 Pipes of beer guage 286 hhd., how much does each guage? *Ans.* 1 hhd. 53 gal. 1 qt.

6. A ship sailed 39 deg. 54 m. 57 sc. in 19 days: How far did she sail each day on an average?

Ans. 2 deg. 6 m. 3 sc.

7. A certain wall is 10 ft. high, 5 ft. thick, and contains 1000 solid feet: How long is the wall? *Ans.* 20 ft.

NOTE.—In the above sum, divide the number of feet contained in the wall by the thickness, and that quotient by the height.

CASE IV.

Where the shares of partners are equal.

EXAMPLES.

1. A man divided a piece of land, measuring 664 ac. 1 ro. 22 rd., equally among his seven sons: How much land did each son receive? *Ans.* 94 ac. 3 ro. 26 rd.

2. A man died leaving to his widow and six children, five building lots each, measuring in all 2 ac. 100 rd.: How much land did each one receive? *Ans.* 60 rd.

3. A prize consisting of cotton, worth $5000, (the

captain being lost,) is to be equally divided among 19 sailors; the weight of the cotton is 26 tons, 2 cwt. 1 qr. 13 lb.: How much cotton does each sailor receive?

Ans. 1 T. 7 cwt. 1 qr. 27 lb. 3 oz. 5$\frac{17}{19}$ dr.

CASE V.

Where the shares of partners are unequal.

EXAMPLES.

1. A privateer takes a prize consisting of coffee, weighing 63 tons, 16 cwt. 1 qr. 8 lb., which is divided in the following manner, viz. the captain receives one half, and the sailors, being 13, receive the other half equally: How much coffee does each sailor receive?

Ans. 49 cwt. 10 lb.

NOTE.—In the above sum, first deduct the captain's half, and then divide the remainder equally among the sailors.

2. A tract of land consisting of 1249 ac. 2 ro. 19 rd. was divided between 3 men, 2 women, and 7 boys; each woman received double to a boy, and each man double to a woman: How much land did each one receive?

Ans.
54 ac. 1 ro. 13 rd. each boy's share.
108 ac. 2 ro. 26 rd. each woman's share.
217 ac. 1 ro. 12 rd. each man's share.

NOTE.—In the above sum, the number of shares being 23, first divide the quantity of land by 23, which gives the amount of one share; then multiply that amount by 2, and it gives two shares to a woman; lastly, multiply either the share of a boy by 4, or the share of a woman by 2, and it will give four shares to a man.

3. A. B. and C. bought 156 hhd. 8 gal. of molasses; B. bought three times as much as A., and C. four times as much as B.: How much did each one buy?

Ans.
9 hhd. 47 gal. 3 qt. A's
29 hhd. 17 gal. 1 qt. B's
117 hhd. 6 gal. 0 qt. C's
share.

4. A privateer took a prize consisting of 13056 bushels of salt, which was divided in the following manner, viz. the owners received one half, the officers one fourth, and the remainder was divided equally among 136 sailors: How much salt did each sailor receive? *Ans.* 24 bu.

Questions and Exercises in Compound Division.

1. During the 36 years of St. Paul's apostleship, he travelled by land and water in different countries, 9000

miles : How many miles did he travel on an average yearly ? *Ans.* 250.

2. The Roman army commenced the siege of Jerusalem April 14th, and from that time to July 1st, out of only one gate, were carried 115866 corpses, exclusive of a great number thrown over the walls daily : How many were carried out at that gate, within that time, on an average daily ? *Ans.* 1485$\frac{36}{78}$.

3. The circuit of the walls of the vast Babylon, that prodigious work of queen Semiramis, which employed some hundred thousands of men for many years, was 60 miles, the height 350 feet, and the breadth 87 feet : What length of wall would it make, 6 feet high, and 3 feet thick ? *Ans.* 101500 Miles.

NOTE.—In the above sum, first multiply the length, breadth, and height of the given wall together, which will give the whole solid contents; then multiply the height of the proposed wall by its breadth, and by the product, divide the contents of the given wall.

4. In Nov. 1820, the waggon (in length 26 ft. 8 in.) and team (composed of 6 horses) of R. W. Hamilton, Esq. arrived in Alexandria (D. C.) from Hamilton Mills, a distance of 80 miles, with a load of 55 barrels of flour, weighing 5 T. 6 cwt. 0 qr. 7 lb., the waggon weighed 1 T. 6 cwt. 0 qr. 3 lb. : What was the weight each horse drew, and how much flour did each barrel contain on an average ?

Ans. { Each horse drew 1 T. 2 cwt. 0 qr. 1 lb. 10$\frac{4}{6}$ oz.
Each barrel contained 1 cwt. 3 qr. 19 lb. 15$\frac{39}{55}$ oz. of flour.

5. In 1819, there were fatted and killed in the town of Brooklyn (Ct.) 1130 hogs, which weighed 136 T. 18 cwt. 3 qr. 17 lb. : What was the average weight of each hog ? *Ans.* 2 cwt. 1 qr. 19 lb. 7$\frac{522}{1130}$ oz.

REDUCTION.

Q. What does Reduction teach ?

A. Reduction teaches to change numbers of one denomination, to others of different denominations, retaining the same value.

Q. How many kinds of Reduction are there ?

A. There are two kinds, viz.—Descending and Ascending; the former of which, is performed by Multiplication, and the latter by Division.

REDUCTION DESCENDING.

Q. What is Reduction Descending?

A. Reduction Descending, is when high denominations are to be brought into lower, as tons into hundreds, quarters, pounds, &c.; centuries into years, days, hours, &c.

RULE.

Q. How do you proceed in Reduction Descending?

A. In Reduction Descending, multiply the highest denomination given, by so many of the next less as make one of that greater, adding in those of the same name; and so continue to do, till the sum is reduced to the denomination required.

PROOF.

Q. How is Reduction Descending proved?

A. Change the order of the question, and divide the last product by the last multiplier, and so proceed with the rest.

EXAMPLES.

Note.—The method of proceeding in Reduction Descending illustrated.

TROY WEIGHT.

1. What is the number of grains in 9 lb. 6 oz. 4 pwt. 10 gr.?

lb. oz. pwt. gr.	Proof. 2|0	
9 6 4 10	24) 54826 (228|4	
12 oz. in a pound.	48	——
——	——12) 114——4 pwt.	
114 oz.	68	——
20 pwts. in an oz.	48	9 lb. 6 oz. 4 pwt. 10 gr.
——	——	
2284 pwt.	202	
24 grains in a pwt.	192	
——	——	
9146	106	
4568	96	
——	——	
54826 gr. *Ans.*	10 gr.	
——	——	

NOTE.—To find the number of grains contained in the above sum, first multiply the 9 lb. by 12, and add in the 6 oz., and it makes 114 oz., which multiply by 20, and add in the 4 pwt., and it makes 2284 pwt., which multiply by 24, and it makes 54826 gr., the answer to the question.

To prove the work, divide the 54826 gr. by 24, which gives 2284 pwt. and 10 gr. remainder; then divide the 2284 pwt. by 20, which gives 114 oz. and 4 pwt. remainder; lastly, divide the 114 oz. by 12, which gives 9 lb. and 6 oz. remainder. The last quotient and several remainders being 9 lb. 6 oz. 4 pwt. 10 gr., prove the work to be correct.

2. In 17 lb. 11 oz. 19 pwt. 23 gr., how many grains? *Ans.* 103679 gr.

3. In 149 lb. 9 oz., how many pennyweights? *Ans.* 35940 pwt.

4. In 10 oz. 16 pwt. 20 gr., how many grains? *Ans.* 5204 gr.

5. In 712 lb., how many grains? *Ans.* 4101120 gr.

6. In 972 lb. 11 oz. 14 pwt. 7 gr., how many grains? *Ans.* 5604343 gr.

7. In 7 caskets of jewels, each containing 9 lb. 7 oz., how many grains? *Ans.* 386400 gr.

REDUCTION ASCENDING.

Q. What is Reduction Ascending?

A. Reduction Ascending is when low denominations are to be brought into higher, as drams into ounces, pounds, &c.; seconds into minutes, hours, &c.

RULE.

Q. How do you proceed in Reduction Ascending?

A. In Reduction Ascending, divide the lowest denomination given, by so many of that name as make *one* of the next higher, and so continue to do, till you have brought it into the denomination required: the last quotient, with the several remainders, (if any,) will be the answer, and the latter will be parts of the same name as the divisor.

PROOF.

Q. How is Reduction Ascending proved?

A. Change the order of the question, and multiply the last quotient by the last divisor, and so proceed with the rest.

NOTE.—Reduction Descending and Ascending reciprocally prove each other.

EXAMPLES.

NOTE.—The method of proceeding in Reduction Ascending illustrated.

TROY WEIGHT.

1. What is the number of pounds in 56918 pwt. of silver?

2|0)5691|8

12)2845—18 pwt.

237 lb. 1 oz. 18 pwt. *Ans.*

Proof.

237 lb. 1 oz. 18 pwt.

12

2845

20

56918 pwt.

NOTE.—To find the number of pounds contained in the above sum, first divide the given number of pennyweights by 20; *i. e.* cut off the cypher (0) of the divisor, and also the right hand figure (8) of the dividend; then divide the remaining figures of the dividend by the 2, which gives 2845 oz. and 18 pwt. over. Lastly, divide the ounces by 12, which gives 237 lb. and 1 oz. over. The answer is then 237 lb. 1 oz. 18 pwt.

To prove the work, multiply the 237 lb. by 12, and add in the 1 oz. and it makes 2845 oz., which multiply by 20, and it makes 56918 pwt. which proves the work to be correct.

2. In 647092 grains of silver, how many pounds?
Ans. 112 lb. 4 oz. 2 pwt. 4 gr.

3. In 7642000 grains of gold, how many pounds?
Ans. 1326 lb. 8 oz. 16 pwt. 16 gr.

4. In 9127 grains, how many ounces?
Ans. 19 oz. 0 pwt. 7 gr.

5. In 110027 pennyweights of jewels, how many pounds? *Ans.* 458 lb. 5 oz. 7 pwt.

REDUCTION DESCENDING AND ASCENDING.

TROY WEIGHT.

1. In 44 lb. 9 oz. 16 pwt. 7 gr. how many grains?
Ans. 258151 gr.

2. In 258151 gr. how many pounds?
Ans. 44lb. 9 oz. 16 pwt. 7 gr.

3. In 67491 gr. how many pounds?
Ans. 11 lb. 8 oz. 12 pwt. 3 gr.

4. In 11 lb. 8 oz. 12 pwt. 3 gr., how many grains?
Ans. 67491 gr.

NOTE.

Q. When it is required to know how many sorts of weight, measure, &c. of different denominations, and of equal number, are contained in any number of another kind, how do you proceed?

A. Reduce the several denominations of weight, measure, &c. into the lowest denomination mentioned, and add them together for a divisor; then reduce the number given, into the same denomination for a dividend, and the quotient arising from division will be the answer required.

PROOF.

Q. What is the method of proof?

A. By changing the order of the question, and multiplying and dividing, &c. inversely.

1. In 5 silver bowls, each weighing 4 lb., how many pounds, ounces, pennyweights, and grains, of each an equal number?

Operation.

```
                            5 bowls.
1 lb. is 5 7 6 0 gr.        4 lb.
1 oz. -    4 8 0 gr.      ———
1 pwt. -     2 4 gr.      2 0 lb. weight of the bowls.
               1 gr.  5 7 6 0 gr. in 1 pound.
         ———————      ———————                  [6 gr. over.
Divis. 6 2 6 5   )1 1 5 2 0 0(1 8  Ans. and 5 oz. 1 pwt.
                  6 2 6 5
                  ———————
                  5 2 5 5 0
                  5 0 1 2 0
                  ————————— (2|0)
              2 4)2 4 3 0(1 0|1
                  2 4       ———
                  ———         5 oz. 1 pwt.
                      3 0
                      2 4
                      ———
                        6 gr.
                      ———
```

NOTE.—To find the answer of the above sum, first find the amount of 1 pound, 1 ounce, 1 pennyweight, and 1 grain in grains, for a divisor; then find the number of pounds in the 5 bowls, which being 20 lb. multiply them by the number of grains in 1 lb. and divide the product by the divisor, which gives 18 for the answer; and 2430 gr. remain, which reduce to pennyweights, and then to ounces, and it gives 5 oz. 1 pwt. 6 gr.

2. How many spoons, each weighing 3 oz. 14 pwt. can be made of 24 lb. 1 oz. of silver?

Ans. 6½ dozen, and 8 pwt. over.

3. How many rings can be made of 1 lb. 7 oz. of gold, if each ring weigh 4 pwt. 23 gr.?

Ans. 76 rings, and 3 pwt. 4 gr. over.

4. How many tankards, each weighing 3 oz. 17 pwt., and table spoons, each weighing 1 oz. 16 pwt., and tea spoons, each weighing 6 pwt. 3 gr., of each sort an equal number, can be made of 27 lb. 4 oz. of silver?

Ans. 55 of each sort, and 8 pwt. 3 gr. over.

Note.—In the above sum, reduce the weight of a tankard, table spoon, and tea spoon, each to grains, and add them together for a divisor; then reduce the given weight of silver to grains for a dividend, which divide by the divisor: there being a remainder of 195 grains, reduce it to pennyweights.

5. How many rings, of each sort an equal number, can be made of an ingot of gold, weighing 4 lb. 12 gr., if each ring of one sort weigh 6 pwt. 9 gr., another sort weigh each 5 pwt. 22 gr., and a third sort weigh each 4 pwt. 10 gr.? *Ans.* 57 rings of each sort, and 195 gr. remainder.

6. An ounce of gold can be extended upon silver wire 1300 miles: How far can a grain of gold be extended upon it? *Ans.* 2 M. 5 fur. 26 rd. 11 ft.

Note.—In the above sum, reduce the one ounce of gold to grains for a divisor.

AVOIRDUPOIS WEIGHT.

1. How many ounces in 18 cwt. 3 qr. 10 lb. of rice?

```
      cwt. qr. lb.
       18   3  10
        4 quarters in 1 cwt.
      ----
       75 qr.
       28 pounds in 1 qr.
     -----
      610
     150
     -----
     2110 lb.
       16    ounces in 1 lb.
    ------
    12660
    2110
    ------
    33760 oz. Ans.
```

2. How many hundred weight, in 33760 oz. of rice?
Ans. 18 cwt. 3 qr. 10 lb.

3. In 1 T. 7 cwt. 2 qr. 21 lb. 15 oz. 10 dr., how many drams? *Ans.* 794106 dr.

4. In 794106 dr., how many tons?
Ans. 1 T. 7 cwt. 2 qr. 21 lb. 15 oz. 10 dr.

5. Reduce 2 T. 2 cwt. 0 qr. 2 lb. 3 oz. 6 dr. of American cordage to drams. *Ans.* 1204790 dr.

6. Bring 1204790 dr. into tons.
Ans. 2 T. 2 cwt. 0 qr. 2 lb. 3 oz. 6 dr.

7. In 27 pigs of lead, each weighing 5 cwt. 1 qr. 20 lb., how many tons? *Ans.* 7 T. 6 cwt. 2 qr. 8 lb.

8. If 27 pigs of lead weigh 7 T. 6 cwt. 2 qr. 8 lb., what is the weight of 1 pig of lead?
Ans. 5 cwt. 1 qr. 20 lb.

9. In 10 chests of Hyson tea, each weighing 2 cwt. 3 qr. 15 lb., how many hundred weight?
Ans. 28 cwt. 3 qr. 10 lb.

10. If 10 chests of Souchong tea weigh 28 cwt. 3 qr. 10 lb. how much will 1 chest weigh?
Ans. 2 cwt. 3 qr. 15 lb.

11. A grocer has 14 hhds. of New-Orleans sugar, each weighing 7 cwt. 2 qr. 12½ lb. which he would put into boxes containing each 1 cwt. 3 qr. 21 lb.: How many boxes will it require? *Ans.* 55 boxes.

12. A grocer has 55 boxes of white Havana sugar, each weighing 1 cwt. 3 qr. 21 lb. which he wishes to put into hogsheads containing each 7 cwt. 2 qr. 12½ lb.: How many hogsheads will it require? *Ans.* 14 hhds.

13. A tobacconist has 29 hhds. of Richmond tobacco, each weighing 7 cwt. 2 qr. 12 lb.: How many parcels will it make at 25 lb. each?
Ans. 988 parcels, and 8 lb. remainder.

14. In 94640 lbs. of bloomed iron, how many tons, and how many drams? *Ans.* 42¼ tons, and 24227840 dr.

15. An iron-monger sold 42¼ tons of Swedes iron at $105 a ton: How many pounds, and how many ounces did he sell?
Ans. $\begin{cases} 94640 \text{ lb.} \\ 1514240 \text{ oz.} \end{cases}$

16. Before the French revolution, St. Domingo exported, annually, seventy million pounds of cotton: How many hundred weight were exported from thence annually? *Ans.* 625000 cwt.

17. In 1817, the U. States exported 35714 T. 5 cwt. 2 qr. 24 lb. of cotton: How many pounds did they export? *Ans.* Eighty million.

18. The bell, recently cast in Moscow for the Tower, weighs 252000 lbs.: How many tons does it weigh?
Ans. 112½ tons.

19. Six thousand tons of hemp were raised, in Kentucky, in a year: How many pounds were raised?
Ans. 13440000 lb.

APOTHECARIES WEIGHT.

1. In 61259 gr., how many pounds?

2|0)6125|9

3)3062—19 gr.

8)1020—2 ℈.

12)127—4 ʒ.

10 ℔. 7 ℥. 4 ʒ. 2 ℈. 19 gr. *Ans.*

2. Reduce 10 ℔. 7 ℥. 4 ʒ. 2 ℈. 19 gr. of medicine to grains? *Ans.* 61259 gr.

3. How many grains in 11 ℔. 7 ℥. 6 ʒ. 1 ℈. 9 gr. of medicine? *Ans.* 67109 gr.

4. Reduce 67109 gr. to pounds.
Ans. 11 ℔. 7 ℥. 6 ʒ. 1 ℈. 9 gr.

WINE MEASURE.

1. In 5 T. 1 P. 1 hhd. 61 gal. 3 qt. 1 pt. of Port wine, how many pints?

T. P. hhd. gal. qt. pt.
5 1 1 61 3 1
2 Pipes in 1 tun.
11 P.
2 hogsheads in 1 P.
23 hhd.
63 gallons in 1 hhd.
130
138
1510 gal.
4 quarts in 1 gal.
6043 qt.
2 pints in 1 qt.
12087 pt. *Ans.*

2. Reduce 6043 qt. of Madeira wine to hogsheads.
Ans. 23 hhd. 61 gal. 3 qt. 1 pt.

3. How many half pints of sugar-house molasses in 96 hhds.? *Ans.* 96768 half pt.

4. Bring 96768 half pints of New-Orleans molasses into hogsheads. *Ans.* 96 hhd.

5. How many bottles, containing 3 pts. each, can be filled with 1 hhd. of (4th proof) Cog. brandy?
Ans. 168 bottles.

6. How much rum in 168 bottles, containing 3 pt. each? *Ans.* 1 hhd.

7. How many gills, pints, quarts, and gallons, of each an equal number, can be filled from 3 hhd. of (1st proof) Holland gin? *Ans.* 134, and 2 qt. 0 pt. 2 gl. over.

8. In 1746000919 gl. of cider, how many tuns?
Ans. 216517 T. 1 P. 1 hhd. 55 gal. 2 qt. 1 pt. 3 gl.

9. In 216517 T. 1 P. 1 hhd. 55 gal. 2 qt. 1 pt. 3 gl., how many gills? *Ans.* 1746000919 gl.

10. In 9 hhds. of Virginia peach brandy, how many gallons, quarts, pints, and gills, of each an equal number?
Ans. 403, and 2 pt. 1 gl. over.

ALE, OR BEER MEASURE.

1. In 2 B. 1 hhd. 53 gallons, how many pints?

B. hhd. gal.
2 1 53
2 hogsheads in 1 B.

5 hhds.
54 gallons in 1 hhd.

323 gal.
4 quarts in 1 gal.

1292 qt.
2 pints in 1 quart.

2584 pt. *Ans.*

2. In 2584 pt., how many butts?
Ans. 2 B. 1 hhd. 53 gal.

3. Reduce 70064712 pt. of beer to butts.
Ans. 81093 B. 0 hhd. 45 gal.

4. In 81093 B. 45 gal., how many gills?
Ans. 280258848 gl.

5. In 1 Puncheon of beer, how many half pints?
Ans. 1152 half pt.

6. Bring 1152 half pints into Puncheons.
Ans. 1 puncheon.

DRY MEASURE.

1. In 7679 pt., how many loads of Liverpool blown salt?

2) 7 6 7 9

4) 3 8 3 9—1 pt.

2) 9 5 9—3 qt.

4) 4 7 9—1 gal.

4|0) 1 1|9—3 pk.

2 lo. 39 bu. 3 pk. 1 gal. 3 qt. 1 pt. *Ans.*

2. Reduce 2 lo. 39 bu. 3 pk. 1 gal. 3 qt. 1 pt., to half pints. *Ans.* 15358 half pt.

3. In 90 lasts of N. River wheat, how many pints?
Ans. 460800 pt.

4. How many lasts of Southern wheat, in 460800 pt.?
Ans. Ninety lasts.

5. In 900 bu. 3 pk. of corn, how many barrels, each containing 3 bu. 3 pk.?
Ans. 240 barrels, and 3 pk. over.

6. How many bushels in 240 barrels of barley, each containing 3 bu. 3 pk.? *Ans.* 900 bu.

7. A salt-boiler would pack 19458 bu. of Salina salt, in barrels containing 4 bu. 2 pk. each: How many barrels will it require? *Ans.* 4324 barrels.

8. A man had 4324 barrels of Turks-Island salt, each containing 4 bu. 2 pk: How many bushels had he?
Ans. 19458 bu.

CLOTH MEASURE.

1. In 603 na. India satin, how many yards?

4)6 0 3
4)1 5 0—3 na.
3 7 yd. 2 qr. 3 na. *Ans.*

2. In 37 yd. 2 qr. 3 na., how many nails?
Ans. 603 na.

3. Reduce 720 yd. of plaid gingham to nails, and also to Ells Flemish.
Ans. { 11520 na.
960 E. Fl.

4. Bring 11520 na. and also 960 E. Fl. of Italian crape, each into yards. *Ans.* 720 yd. each.

5. In 4620 na. of silk drab, how many E. E., and how many E. F.?
Ans. { 231 E. E.
192½ E. F.

6. In 231 E. E. and 192½ E. F. of French lutestring, how many nails each? *Ans.* 4620 na. each.

7. How many yards of book muslin in 1967 E. E.?
Ans. 2458 yd. 3 qr.

8. In 2458 yd. 3 qr. of gold cord, how many Ells English? *Ans.* 1967 E. E.

9. How many sailor's jackets can be made out of 97¾ yd. of blue nankeen, allowing 1 yd. 1 qr. 3 na. to each jacket? *Ans.* 68 jackets.

10. How many yards of cloth will make a sailor's jacket, if 97¾ yd. make 68 jackets? *Ans.* 1 yd. 1 qr. 3 na.

11. In 23 pieces of changeable sarcenet, each containing 121 E. F., how many yards, quarters, and E. E. each?
Ans. { 4174½ yd.
16698 qr.
3339 E. E. 3 qr.

12. In 12 pieces of Canton crape, each containing 36 yd. 2 qr. 3 na., how many yards, quarters, and nails, of each an equal number?
Ans. 335, and 2 qr. 1 na. over.

LONG MEASURE.

1. In 5 M. 6 fur. 37 rd. 16 ft. 3 in., how many inches?

M. fur. rd. ft. in.
5 6 37 16 3
8 furlongs in 1 M.

46 fur.
40 rods in 1 fur.

2)1877 rd.
16 ½ feet in 1 rd.

938 ½
11278
1877

30986 ½ ft.
12 inches in 1 ft.

371841 in. *Ans.*

NOTE.—In the above sum, to multiply by 16 ½ ft., divide the number of rods by the denominator (2) of the fraction, which will have a remainder of 1, equal to ½ a foot; then multiply by the 16: in reducing the feet to inches, the remainder, (½ a foot,) being 6 inches, must be added to the inches.

2. In 371841 in. how many miles?

Ans. 5 M. 6 fur. 37 rd. 16 ft. 3 in.

NOTE.—In the above sum, reduce the inches to feet, and there will be 9 in. remainder; then, reduce the feet to rods, multiply both the dividend and divisor by 2; then divide, and it will leave a remainder of 31, which divide by 2, and it will give 15 ft., and a remainder of 1 equal to ½ a foot; the ½ a foot being 6 in. add them to the 9 in., and they make 1 ft. which add to the 15 ft., and 3 in. remain.

3. In 145 miles, how many rods, and how many inches?

Ans. { 46400 rd.
9187200 in.

4. How many miles in 9187200 in.? *Ans.* 145 M.

5. How many barley-corns will reach from New-York to Albany, it being 165 miles? *Ans.* 31363200 bc.

6. Reduce 31363200 bc. to miles. *Ans.* 165 M.

7. It takes 1585267200 in. to reach round the globe, how many degrees, and how many barley-corns, will extend round it?

Ans. { 360 deg.
4755801600 bc.

8. How many degrees will reach round the globe, it being 1585267200 in.? *Ans.* Three hundred and sixty.

9. How many times will a carriage wheel of 15 ft. 10 in. in circumference revolve, in running from New-York to Utica, by way of Albany; it being 261 miles?

Ans. 87036 times, and 12 in. over.

NOTE.—In the above sum, reduce the circumference of the wheel to inches, and also the 261 miles; then divide the latter by the former.

10, What space will a wheel pass over, being 15 ft. 10 in. in circumference, in revolving in a straight line, 87036 times? *Ans.* 260 M. 7 fur. 39 rd. 6 ft. 6 in.

NOTE.—In the above sum, multiply the number of times the wheel turns round, by the circumference of it reduced to inches; then reduce the product to miles.

11. If the forward wheels of a coach be 13 ft. 9 in. in circumference, and the hind wheels 15 ft. 4 in., how many more times will the forward wheels roll round than the hind ones, in running from Hartford to Albany, it being 92 miles? *Ans.* 3648 more times.

NOTE.—In the 11th sum, find the number of times the forward wheels will roll round, and also of the hind wheels; then subtract the latter from the former.

12. On the 14th of Oct. 1820, Mr. Guille ascended in a balloon the distance of 35000 feet, and descended again in safety: How many miles did he ascend?

Ans. 6 M. 5 fur. 1 rd. 3 ft. 6 in.

13. There is a place 150 miles from the village of Arkansas, where the water gushes out of a mountain so hot, that a hog may be scalded and dressed with the water as it comes from the ground: How many half inches are there in the 150 miles? *Ans.* 19008000 half inches.

14. In 749 M. 6 fur. 9 ch. 2 rd. 20 lk., how many links?

Ans. 5998970 lk.

15. Bring 5998970 lk. into miles.

Ans. 749 M. 6 fur. 9 ch. 2 rd. 20 lk.

16. How many miles in 1476792 lk.?

Ans. 184 M. 4 fur. 7 ch. 3 rd. 17 lk.

17. Reduce 184 M. 4 fur. 7 ch. 3 rd. 17 lk. to links.

Ans. 1476792 lk.

18. In 97 miles, how many miles, furlongs, chains, rods, and links, of each an equal number?

Ans. 85, and 2 ch. 3 rd. 15 lk. over.

19. The great Pyramid in Egypt, is 315 ft. in height: How many barley-corns will reach to its summit?

Ans. 11340 bc.

20. The bridge over Genesee river, is an arch; and from its centre to the water below, is 196 ft.: How far is it in rods? *Ans.* 11 rd. 14 ft. 6 in.

21. A stone, dropped from the hand of a person standing on the south-east part of the fort Jundan, in India, would fall 2000 feet perpendicular: How many roods would it fall? *Ans.* 3 ro. 1 rd. 3 ft. 6 in.

22. The U. States ship Ohio measures 160 feet keel, and her tonnage is 2147; she mounts 86 guns: What is the length of her keel in rods? *Ans.* 9 rd. 11 ft. 6 in.

LAND, OR SQUARE MEASURE.

1. In 1 square mile, how many square inches?

```
             Sq. M.
               1
             6 4 0  acres in 1 sq. M.
             -----
             6 4 0  ac.
             1 6 0  rods in 1 ac.
           -------
           3 8 4
           6 4
       -----------
   4 ) 1 0 2 4 0 0  rd.
           2 7 2 ¼  feet in 1 rd.
       -----------
           2 5 6 0 0
         2 0 4 8
       7 1 6 8
     2 0 4 8
     ---------------
     2 7 8 7 8 4 0 0  ft.
           1 4 4      inches in 1 foot.
   -----------------
     1 1 1 5 1 3 6
   1 1 1 5 1 3 6
   2 7 8 7 8 4
   -------------------
   4 0 1 4 4 8 9 6 0 0  in. Ans.
```

NOTE.—In the above sum, to multiply the rods by the $\frac{1}{4}$ of a foot, divide the number of rods by the denominator (4.)

2. In 4014489600 square inches, how many square miles? *Ans.* One square mile.

3. In 19164 square rods, how many acres?
Ans. 119 ac. 124 rd.

4. In 119 ac. 124 rd., how many square rods?
Ans. 19164 rd.

5. A farmer owned 397 ac. of land, and sold 329 ac. 3 ro. 29 rd. of it: How many roods had he remaining unsold? *Ans.* 268 ro. 11 rd.

6. A farmer owned 329 ac. 3 ro. 29 rd. of land, and bought 268 ro. 11 rd. more: How much land did he then have? *Ans.* 397 ac.

7. In 75 ac. 3 ro. 18 rd., how many shares of 102 rd. each? *Ans.* 119 shares.

8. In 119 shares of 2 ro. 22 rd. each, how much land?
Ans. 75 ac. 3 ro. 18 rd.

9. How many acres in a field 196 rd. in length, and 125 rd. in breadth? *Ans.* 153 ac. 20 rd.

NOTE.—The length and breadth of any square, (being equal or not,) multiplied together, give the whole contents.

10. A certain field, being 125 rd. in breadth, contains 153 ac. 20 rd.: What is the length of the field?
Ans. 196 rd.

11. How much carpeting, 3 qr. 2 na. in width, will cover a floor 22 ft. in length, and 19 ft. in breadth?
Ans. $53\frac{90}{1134}$.

NOTE.—In the above sum, first find the contents of a yard of the carpeting in inches for a divisor; then find the contents of the floor in inches for a dividend, and divide the latter by the former.

12. The royal Mission Chapel erected at Papaoa, (Otaheite,) by the king Pomare, is 712 ft. long, by 54 ft. wide; and contains 280 outside posts, 133 windows of sliding shutters, 29 doors, and 3 square pulpits, 260 ft. apart: What are the superficial contents or area of the Chapel? *Ans.* 38448 ft.

13. The Navy Yards occupied by the U. States, are the following, viz. 1 at Portsmouth containing 53 ac. and cost $53000; 1 at Charlestown do. 84 ac. do. $89214; 1 at New-York, (situated on Long-Island,) do. 40 ac. do. $40000; 1 at Philadelphia do. 11 ac. do. $37000; 1 at

Washington do. 37 ac. do. $4000; and 1 at Gosport do. 16 ac. do. $12000: What is the whole number of acres, and also, the whole amount in rods; likewise, the amount of the cost, and the cost an acre, on an average?

Ans.
241 ac.
88560 rd.
$235214, amount of the cost.
$975,99$\frac{41}{241}$ cost an acre.

14. The sums which have been paid, and remain to be paid, under Treaties made by the U. States with the Indian tribes, to indemnify them for cessions of lands to the U. States, are $2542916: the expense of surveying the public lands from March 4th, 1789, to Dec. 31st, 1819, has been $4243632: the whole quantity of land which has been sold by the U. States, as well before as since the opening of the Land Offices, up to Sept. 30th, 1819, is 20138482 ac.; and the amount for which it has been sold is $45098696: of this amount $23098039 had been paid, and $22000657 remained to be paid, at the close of Sept. 1819: How much does the amount for which the land was sold, up to Sept. 1819, exceed the amount both of the purchase and surveying of public lands; and also, for how much was the land sold an acre, on an average; likewise how many rods were contained in the number of acres?

Ans.
$38312148.
$2,234.†
3222157120 rd.

15. The quantity of lands surveyed in the several Land Office districts is 72805092 ac. whereof 18601930 ac. have been sold; the quantity surveyed for military bounty lands, is 12315360 ac.; the whole quantity of land purchased of the Indians by the various treaties and cessions, is estimated at 191978536 ac.: How many acres in the Land Office districts remain unsold; and how many square rods are contained in the whole quantity of land purchased of the Indians?

Ans.
54203162 ac. unsold.
30716565760 rd.

16. How many shingles will cover a building 96 ft. in length, and rafters 25 ft., allowing each shingle to be 4 in. wide, and each course 6 in.? *Ans.* 28800 shingles.

Note.—In the above sum, find the contents of the whole roof in square inches, which divide by the number of square inches in a shingle.

SOLID, OR CUBIC MEASURE.

1. In 758592 solid inches, how many Tons of round timber?

```
                      (4|0)
1728)758592(43|9
     6912          10 T. 39 ft. Ans.
      6739
      5184
      15552
      15552
          0
```

2. In 10 T. 39 ft., how many solid inches?
Ans. 758592 in.

3. In 29 T. 47 ft. of hewn timber, how many solid inches? *Ans.* 2586816 in.

4. Bring 2586816 in. into tons. *Ans.* 29 T. 47 ft.

5. Reduce 65 cords of wood to feet; and also, to inches.
Ans. { 8320 ft.
14376960 in.

6. How many cords of wood in 14376960 solid inches?
Ans. 65 cords.

7. In 1728976423 solid inches, how many tons of hewn timber? *Ans.* 20011 T. 15 ft. 103 in.

8. In 20011 T. 15 ft. 103 in., how many solid inches?
Ans. 1728976423 in.

9. In 9476107430 in., how many cords of wood?
Ans. 42842 cd. 82 ft. 806 in.

10. Reduce 42842 cd. 82 ft. 806 in. of wood, to inches.
Ans. 9476107430 in.

11. How many feet in a stick of timber 42 ft. long, 2 ft. wide, and 18 in. deep? *Ans.* 126 ft.

NOTE.—The length, breadth, and depth of any regular solid, multiplied together, give the whole contents. When two dimensions are multiplied in feet, and one in inches, divide by 12, and the quotient will be feet; when one dimension is multiplied in feet, and the other two in inches, divide by 144, and the quotient will be feet.

12. How many feet in a stick of timber 48 ft. long, 20 in. wide, and 18 in. deep? *Ans.* 120 ft.

13. How many feet in a stick of timber 24 ft. long, and 2 ft. square? *Ans.* 96 ft.

14. What must be the length of a stick of timber, that is 2 ft. square, to measure 96 ft.? *Ans.* 24 ft.

NOTE.—In the above sum, divide the 96 ft. by the breadth of the timber, and then the quotient by the depth.

15. How many cords in a pile of wood 80 ft. long, 4 ft. wide, and 6 ft. high? *Ans.* 15 cds.

16. What must be the length of a pile of wood, that is 4 ft. wide, and 6 ft. high, to make 15 cds.? *Ans.* 80 ft.

Note.—In the above sum, multiply the number of feet in a cord by the number of cords; then divide the product by the width, and the quotient by the height.

17. How many bricks, 8 in. long, 4 in. wide, and $2\frac{1}{2}$ in. thick, will it require to erect a building 96 ft. long, 74 ft. wide, and 20 ft. high, and the walls $1\frac{1}{2}$ ft. thick? *Ans.* 216432 bricks.

Note.—In the above sum, add together the length of both sides and both ends of the building; then deduct 6 ft. for the corners, and multiply by the thickness; then multiply by the height reduced to inches; lastly, divide by the number of inches contained in a brick.

18. How many cubic feet in a grindstone, 24 in. diameter, and 4 in. thick? *Ans.* 1 ft.

Note.—*To find the contents of grindstones;* to the diameter, add the semi-diameter; multiply the amount of these by the semi-diameter and the product thence arising by the thickness; then divide by 1728, and the quotient will be the contents.

19 What are the contents of a grindstone, 36 in. diameter, and 4 in. thick? *Ans.* $2\frac{1}{4}$ ft.

TIME MEASURE.

1. In 45 yr. 362 d., how many seconds?

```
          yr.   d.
       4)4 5 , 3 6 2
         3 6 5 ¼ days in 1 yr.
         -----
           1 1 ¼
         2 2 5
       2 7 0
     1 3 5
         3 6 2
     ---------
     1 6 7 9 8 ¼ d.
             2 4 hours in 1 d.
   -----------
     6 7 1 9 8
   3 3 5 9 6
   -----------
   4 0 3 1 5 8 h.
             6 0 minutes in 1 h.
 -------------
 2 4 1 8 9 4 8 0 m.
             6 0 seconds in 1 m.
-------------------
1 4 5 1 3 6 8 8 0 0 sc. Ans.
```

NOTE.—In the above sum, to multiply by the ¼ of a day, divide the 45 yr. by the denominator (4) and there will be a remainder of ¼ of a day, which is 6 h.; and, in reducing the days to hours, must be added thereto.

2. In 1451368800 sc., how many years?
Ans. 45 yr. 362 d.

3. How many years, in 147016280 sc.?
Ans. 4 yr. 240 d. 13 h. 51 m. 20 sc.

4. Reduce 4 yr. 240 d. 13 h. 51 m. 20 sc., to seconds?
Ans. 147016280 sc.

5. How many seconds from the birth of our Saviour, to Christmas, A. D. 1821? *Ans.* 57466389600 sc.

6. How many seconds since the declaration of Independence of the U. States?

7. How many days since the commencement of the Christian Era?

8. The cotton manufactory at Waltham, (near Boston,) consumes 400000 lb. of cotton annually; and 200 looms are kept in constant operation by water: How much cotton does it consume monthly? *Ans.* 33333⅓ lb.

9. In the silk mills at Manchester, (England,) there are 26588 wheels, and 17746 diurnal movements; and the whole is actuated by one great water wheel, which goes round three times in a minute; each time it goes round, 73723 yd. of silk are twisted: How many yards are twisted in 12 h.? *Ans.* 159241680 yd.

10. The first settlers of New-England, landed at Plymouth, (Mass.) Dec. 22d, 1620: How many days since?

11. It is calculated that 150000 persons die annually of the consumption: How many is that an hour on an average? *Ans.* 17+.

12. The famous city of Carthage being set on fire by the forces of the Roman army, continued to blaze 17 days: How many seconds did it continue to blaze?
Ans. 1468800 sc.

13. The venerable Henry Francisco, a native of France, died at Whitehall, (N. Y.) in the month of Oct. 1820, aged 133 years: How many seconds of time had he lived? *Ans.* 4197160800 sc.

14. When Europe, like Chaldea of old, was buried in sin, in ignorance, superstition, and idolatry, God raised up the immortal Luther to publish the everlasting gospel,

in 1517, by translating it into the different languages of Europe: How many weeks since?

15. France and Spain settled the two Floridas, and Canada, in 1608: How many hours since?

16. The Revolutionary war, which commenced in 1775, cost the crown of England, 100,000 men, and augmented her debt, 100000000 pounds sterling, and was crowned by the sovereignty and independence of the U. States in 1783: How many minutes since?

17. Several remarkable incidents peculiar to the 21st day of the month, accompanied the life of Louis XVI. (who was executed by the guillotine,) viz. on the 21st of April, 1770, he was married; on the 21st of June following, about 15000 people were trampled to death, and perished at the celebration of his nuptials; 21st of January, 1782, the celebration of the birth of the Dauphin; 21st June, 1791, his flight to Varennes; 21st September, 1792, abolition of royalty; and 21st January, 1793, his execution: How many days from his marriage to his execution? *Ans.* 8310½ days.

18. The U. States met in a general convention held at Philadelphia, in 1787, to frame and recommend a national constitution of government, which was adopted by a majority of all the States, and organized in 1789: How many weeks since?

19. The Sun revolves on its axis, from west to east, in 36848 minutes: How many days is it revolving from west to east? *Ans.* 25 d. 14 h. 8 m.

20. On the 9th of July, 1806, a Jubilee was celebrated in the Hindoo churches, in India, in commemoration of the arrival of the Rev. Messrs. Ziegenbalg and Grundler; they being the two first Protestant Danish Missionaries who arrived in Hindostan; they landed July 9th 1706: How many minutes from the arrival of those two missionaries in India, to the celebration of the jubilee in honour of the Gospel? *Ans.* 52596000 m.

CIRCULAR MOTION.

1. In 9 S. 13° 25′, how many seconds?

S. ° ′
9 13 25
30 degrees in 1 Sign.

283°
60 minutes in 1 degree.

17005′
60 seconds in 1 minute.

1020300″ *Ans.*

2. In 1020300″, how many Signs? *Ans.* 9 S. 13° 25′.

3. How many Signs, in 1199671″? *Ans.* 11 S. 3° 14′ 31″.

4. Reduce 11 S. 3° 14′ 31″ to seconds. *Ans.* 1199671″.

5. In 10 S., how many Signs, degrees, minutes, and seconds, of each an equal number? *Ans.* 9, and 75051″ rem.

PARTICULARS.

1. How many cotton balls in 12 boxes, each containing 1½ great gross? *Ans.* 2592 balls.

2. In 2592 cotton balls, how many Great gross? *Ans.* 1½ G. gross.

3. In 291 lb. of pork, how many score? *Ans.* 14 score, 11 lb.

4. In 14 score, 11 lb., how many pounds? *Ans.* 291 lb.

5. In 6 parcels of paper, each containing 3600 sheets, how many reams? *Ans.* 45 reams.

6. In 45 reams of paper, how many parcels, each containing 3600 sheets? *Ans.* 6 parcels.

7. In 9½ rolls of parchment, how many skins? *Ans.* 570 skins.

8. In 570 skins of parchment, how many rolls? *Ans.* 9½ rolls.

9. In 2 thou. 9 hund. 39 casts, 2 staves, how many staves? *Ans.* 3599 staves.

10. In 3599 staves, how many thousand?
Ans. 2 thou. 9 hund. 39 casts, 2 staves.

11. In 5 thou. 8 hund. 2 bundles, 37 hoops, how many hoops? *Ans.* 7077 hoops.

12. In 7077 hoops, how many thousands?
Ans. 5 thou. 8 hund. 2 bundles, 37 hoops.

REFINER'S WEIGHT.

1. In 9 grains, 19 mites, 17 perrots, 23 blanks, how many blanks?

```
      Gr.  mi.  per.  blk.
       1   1 9  1 7   2 3
       2 0 mites in 1 grain.
       ---
       3 9 mi.
         2 0 perrots in 1 mite.
       -----
       7 9 7 per.
         2 4 blanks in 1 perrot.
     -------
     3 2 1 1
   1 5 9 4
   ---------
   1 9 1 5 1 blk. Ans.
   ---------
```

2. In 19151 blanks, how many grains?
Ans. 1 Gr. 19 mi. 17 per. 23 blk.

3. Reduce 7643210 blanks to grains.
Ans. 796 Gr. 3 m. 7 per. 2 blk.

4. How many blanks, in 796 Gr. 3 mi. 7 per. 2 blk.
Ans. 7643210 blk.

5. In 10 grains, how many blanks? *Ans.* 96000 blk.

6. In 96000 blk., how many grains? *Ans.* 10 Gr.

Questions and Exercises in Reduction.

1. The Rev. G. Whitfield, during the 34 years of his ministry, preached 18 thousand sermons: How many sermons did he preach a day, on an average?
Ans. $1\frac{55815}{124185}$.

2. On the known habitable globe, there are 8953 millions of souls; and the ancients reckoned that the gene-

ration lasted 30 years: How many die daily, and how many hourly, on an average?

Ans. { 817065† die daily.
34044† do. hourly.

3. The island of Michilimackinac, is elevated 310 ft. above the level of the lake, and is 9 miles in circumference: What is its height, and also its circumference in inches?

Ans. { 3720 in. in height.
570240 in. in circum.

4. The whole number of falls of snow from the 12th Nov. 1820, to the 17th April 1821, inclusive, was 26; and the whole depth 113½ inches: What was the depth of each snow, on an average; and also the whole depth in feet?

Ans. { $4\frac{95}{120}$ in. average depth.
9 ft. 5½ in. whole depth.

5. Instances have been mentioned of the lime-tree existing six centuries: How many seconds would it exist within that time? *Ans.* 18934560000 sc.

6. A silver-smith wrought 7 ingots of silver, each weighing 2 lb. 10 oz. 17 pwt. 4 gr., into cups of 6 oz. 4 pwt., table spoons of 3 oz. 7 pwt. and tea spoons of 7 pwt. 9 gr. of each an equal number: How many did he make?

Ans. 24 of each, and 5 oz. 19 pwt. 4 gr. over.

7. A certain ship's cargo consists of 965 hogsheads of Madeira, Sherry, and Malaga wine: Of what burden is the ship, allowing each pint to weigh one pound?

Ans. 217 tons, 2½ cwt.

8. How many shares of 2 ac. 3 ro. 20 rd. each, are contained in two fields; one field contains 147 ac. 1 ro. 4 rd., and the other 91 ac. 2 ro. 30 rd.?

Ans. 83 shares, and 54 rods over.

9. In the Kremlin at Moscow, lies the largest bell in the world, dedicated to St. Peter, and cast in the time of Peter the Great; its circumference is 67 ft. 4 in., its sound bow is 1 ft. 11 in. thick, and its weight is 443772 lb.; it could never be suspended, and to this day, lies in the mould which gave it shape: How many tons did it weigh?

Ans. 198 T. 2 cwt. 1 qr.

10. It has been announced in the Paris papers, that France gained from 1793 to 1797, 261 victories, killed 250000 men of the enemy, took 197000 prisoners, 238 strong places, 319 forts or camps, 7065 pieces of cannon,

and 207 stands of colours: How many minutes from 1793 to 1797? *Ans.* 2103840 m.

11. Manna drops from the sprigs of several trees, but principally from the Gharrab, in the valley of Ghor, which lies 16 miles south from the extremity of the Dead Sea: What is the number of barley-corns in those 16 miles? *Ans.* 3041280 bc.

12. A mow of hay being in length, breadth, and depth, each 40 ft.; take $\frac{3}{4}$ of it out, and how many solid feet will remain? *Ans.* 16000 solid feet.

13. At Newcastle is a coal-pit wrought 5 miles horizontally at the depth of 800 feet: What is its distance, and also its depth in rods?

Ans. { 1600 rd. distance.
48 rd. 8 ft. in depth.

14. The light of burning powder is conveyed to the eye at the rate of 198000 miles in 1 second, and the report moves on at the rate of $\frac{1}{4}$ of a mile in a second: Should you see the light of burning powder 12 seconds before you hear the report, how far are you from the explosion? *Ans.* Three miles.

15. The tail of the comet which appeared in 1811, was 13185200 miles in extent: What was its extent in inches? *Ans.* 835414272000 in.

16. Mr. A. Pease of Enfield, (Ct.) killed a hog in 1820, which weighed 791 lb.; and Mr. S. Rowe of Jamaica, (L. I.) killed one which weighed 722 lb.: How many score did each hog weigh?

Ans. { Mr. Pease's weighed 39 score, 11 lb.
Mr. Rowe's weighed 36 score, 2 lb.

17. A draper purchased 12 bales of cloth, each containing 9 pieces; and each piece contained 35 English Ells: How many yards did he purchase? *Ans.* 4725 yd.

18. How many times will a regular clock strike in 360 days? *Ans.* 56160.

19. The Sun passes through 9 signs of the Zodiac in $\frac{3}{4}$ of a year: How many seconds in those 9 Signs? *Ans.* 972000''.

REDUCTION OF DECIMALS.

RULE.

Q. To find the value of a decimal in the terms of the integer, how do you proceed?

4. Multiply the decimal by the number of parts in the next less denomination, and point off so many figures for a remainder to the right hand of the product, as there are places in the given decimal. Multiply the remainder by the next inferior denomination, and point off a remainder as before; and so on through all the parts of the integer, and the several denominations standing on the left hand, make the answer.

EXAMPLES.

1. What is the value of ,9465 of a pound Troy?

Operation.

,9 4 6 5
1 2 ounces in a pound.

1 1, 3 5 8 0 oz.
2 0 pennyweights in an ounce.

7, 1 6 0 0 pwt.
2 4 grains in a pennyweight.

6 4
3 2

3, 8 4 0 0 gr.

11 oz. 7 pwt. 3,84 gr. *Ans.*

NOTE.—Multiply the decimal by 12 oz. and point off at the right hand of the product, four figures for decimals, and those to the left (11 oz.) will be whole numbers; then multiply the decimals of the ounces by 20 pwt., and point off as before, which leaves 7 pwt. at the left; then multiply the decimals of the pennyweights by 24 gr., and point off as before, and the answer will be 11 oz. 7 pwt. 3,84 gr.

2. What is the value of ,617 of a yard?
Ans. 2 qr. 1 na. 1,962 in.

3. What is the value of ,7695 of a day?
Ans. 18 h. 28 m. 4,8 sc.

4. What is the value of ,527 of a ton?
Ans. 10 cwt. 2 qr. 4 lb. 7 oz. 10,88 dr.

5. What is the value of ,769 of a hogshead of wine?
Ans. 48 gal. 1 qt. 1 pt. 2,304 gl.

6. What is the value of ,9745 of a furlong?
Ans. 38 rd. 16 ft. 2,04 in.

7. What is the proper quantity of ,29612 of an acre? *Ans.* 1 ro. 7,3792 rd.

8. What is the proper quantity of ,099876 of a pound Avoirdupois? *Ans.* 1 oz. 9,568256 dr.

9. What is the proper quantity of ,91235 of a mile? *Ans.* 7 fur. 11 rd. 15 ft. 8 in. 1,488 bc.

10. Find the proper quantity of ,009764 of a cord of wood. *Ans.* 1 ft. 431,640576 in.

11. What is the value of ,09716 of a bushel? *Ans.* 3,10912 qt.

12. What is the value of ,97805 of a mile? *Ans.* 7 fur. 8 ch. 24,4 lk.

13. What is the value of ,876205 of a year? *Ans.* 320 d. 48 m. 46,908 sc.

PROPORTION.

Q. What is Proportion?

A. Proportion is the comparative relation which one thing bears to another; as Symmetry, Size, Ratio, Form, &c.

Q. Of what is the rule of Proportion capable?

A. The rule of Proportion is capable of almost universal application in every branch of business.

Q. Of how many kinds is it?

A. Proportion is of two kinds, Single and Double.

SINGLE PROPORTION.

Q. What does Single Proportion teach?

A. Single Proportion teaches, by having three numbers given, to find a fourth, which must bear the same proportion to the third as the second does to the first.

Q. To how many kinds do questions in Proportion belong?

A. Proportion belongs to two kinds of questions *Direct* and *Inverse*.

Q. What cases belong to Direct questions?

A. Such, and all similar cases, belong to Direct Proportion, as the following, viz. when the value, weight, and measure of any commodity is in proportion to its quantity; when the space gone over, or the amount of work, or consumption, is in proportion to the time; when gain, loss, and interest, when the time is fixed, is in proportion to the capital sum from which it arises; and when the effect produced by any cause, is in proportion to the extent of that cause.

Q. What cases belong to Inverse questions?

A. Such, and the like cases, belong to Inverse Proportion, as the following; for the number sought becomes less, when the circumstances from which it is derived become greater. Thus, when the price of goods increases, the quantity, which may be bought for a given sum, is smaller; when the number of men employed at work is increased, the time in which they may complete it, becomes shorter; and, when the activity of any cause is increased, the quantity necessary to produce any given effect, is diminished.

RULE.

Q. In stating the question, how should the numbers be placed?

A. Place that number for the second term, in Single Proportion, which signifies the same kind of thing as the number sought; then, if the answer will be greater than the second term, place the greater of the other two numbers for the third term; but if less, place the least for the third, and the remaining one for the first.

Q. Having stated the question, what is the method of operation?

A. The method of operation in Single Proportion is to multiply the second and third terms together, divide their product by the first, and the quotient thence arising will be the fourth term, (or answer,) which will signify the same kind of thing, and be in the same denomination as the second term.

NOTE.

Q. How do you determine which number asks the question?

A. It is generally known which number asks the question, by some of these words preceding it: How much? How many? How long? How far? What will? What cost? &c. When the question is stated according to the above rule, the proportion is always thus: As the first term is to the second, so is the third to the fourth, or answer sought:

Or, as 2 is to 4 so is 6 to 12.
Or, as 8 : 6 :: 4 : 3.
Or, as 8 is to 12 so is 4 to 6.
Or, as 2 : 3 :: 4 : 6, &c.

Q. In what are the numbers in each question comprised?

A. In every question in Proportion, three numbers are given; two of which are comprised in a supposition, and the other in a demand. The question being stated, then, if the supposition comprise the first and second terms, the demand will comprise the third.—The question is then in *Direct Proportion.* But if the supposition comprise the second and third terms, the demand will comprise the first.—The question is then in *Inverse Proportion.*

PROOF.

Q. How do you prove Single Proportion?

A. To prove Single Proportion, invert the order of the question, by placing the answer for the first term, the third for the second, and the second for the third; then multiply and divide as before.

EXAMPLES.

Note.—The method of proceeding in Single Proportion illustrated.

1. If 4 lb. of tea cost $6, what will 8 lb. cost at that rate?

	1st tm.	2d tm.	3d tm.
This statement	lb.	$	lb.
reads thus—	4 :	6 ::	8
As 4 lb. is to $6,		8	
so is 8 lb. to $12.		——	
	4)	48	
		——	
		$12 *Ans.*	

Note.—Here, as the thing sought is a number of dollars, place the given number of dollars for the second term; then as 8 lb. will cost more than 4 lb., place the 8 lb. for the third term, and the 4 lb.

for the first.—The product of the second and third terms of any number, will exceed the answer required, as much as the first term exceeds an unit.

PROOF.

2. If $12 buy 8 lb. of tea, how much will $6 buy?

Here as $12 is
to 8 lb., so is $6
to 4 lb.

1st tm. 2d tm. 3d tm.
$ lb. $
12 : 8 :: 6
6

12)48(4 lb. *Ans.*
48

Note.—Place the given number of pounds for the second term; then, as $6 will buy less than $12, place them for the third term, and the $12 for the first.

AGAIN.

3. If 8 lb. of tea cost $12, what will 4 lb. cost?

Here as 8 lb. is
to $12, so is 4 lb.
to $6.

1st tm. 2d tm. 3d tm.
lb. $ lb.
8 : 12 :: 4
4

8)48

$6 *Ans.*

Note.—Here, as dollars are sought, place the given number of dollars for the second term; then as 4 lb. will cost less than 8 lb., place them for the third term, and the 8 lb. for the first.

PROOF.

4. If $6 buy 4 lb. of tea, how much will $12 buy?

Here as $6 is
to 4 lb., so is $12
to 8 lb.

1st tm. 2d tm. 3d tm.
$ lb. $
6 : 4 :: 12
12

6)48

8 lb. *Ans.*

NOTE.—Place the given number of pounds for the second term; then as $12 will buy more than $6, place them for the third term, and the $6 for the first.

NOTE 1st.—In all cases, if the sum be right, the product of the first and fourth terms will be equal to the product of the second and third; as in the preceding example, multiply 6 by 8, and it is equal to 48; so 4 multiplied by 12 is equal to 48.

NOTE 2d.—The four preceding examples are in *Direct Proportion*, and the four succeeding are in *Inverse Proportion*.

5. If a man perform a journey in 6 days, by travelling 8 hours in the day, how long would it take him to perform the same journey, should he travel 12 hours in the day?

Here as 12 h. is to 6 d., so is 8 h. to 4 d.

```
h.   d.    h.
12 : 6 :: 8
     8
   ----
12)48
   ----
     4 d. Ans.
   ----
```

NOTE.—Here, as the thing sought is a number of days, place the given number of days for the second term; then, as the man will perform the journey in less time by travelling 12 hours a day, place the 8 hours for the third term, and the 12 hours for the first.

PROOF.

6. If a man perform a journey in 6 days by travelling 8 hours a day, how many hours a day must he travel to perform it in 4 days?

Here as 4 d. is to 8 h., so is 6 d. to 12 h.

```
d.  h.    d.
4 : 8 :: 6
    6
  ----
4)48
  ----
  12 h. Ans.
  ----
```

NOTE.—Place the given number of hours for the second term; then, as the man will travel less days, he must travel more hours a day, place the 6 days for the third term, and the 4 days for the first.

AGAIN.

7. If a man perform a journey in 4 days, by travelling

12 hours a day, how long would he be performing the same journey, should he travel only 8 hours a day?

Here as 8 h. is	h. d. h.
to 4 d., so is 12 h.	8 : 4 : : 12
to 6 d.	12
	8)48
	6 d. *Ans.*

NOTE.—Here as days are sought, place the 4 days for the second term; then, as the man will travel more days, he may travel less hours a day, place the 12 hours for the third term, and the 8 hours for the first.

PROOF.

8. If a man, by travelling 12 hours a day, perform a journey in 4 days, how many hours a day must he travel to be 6 days performing it?

Here as 6 d. is	d. h. d.
to 12 h. so is 4 d.	6 : 12 : : 4
to 8 h.	4
	6)48
	8 h. *Ans.*

NOTE.—Place the given number of hours for the second term; then, as the man will travel more days, he may travel less hours a day, place the 4 days for the third term, and the 6 days for the first.

9. If 18 yd. of calico cost $5, what will 90 yd. cost? *Ans.* $25.

10. If $25 will buy 90 yd. of calico, how much will buy 18 yd.? *Ans.* $5.

11. If $5 pay for 18 yards of calico, for how many yards will twenty-five dollars pay? *Ans.* 90 yd.

12. If $25 pay for 90 yd. of calico, for how much will five dollars pay? *Ans.* 18 yd.

13. If 15 men build a wall in 28 days, how many men can build it in 6 days? *Ans.* 70 men.

14. If 70 men build a wall in 6 days, how many men can build it in 28 days? *Ans.* 15 men.

15. If 70 men in 6 days build a wall, in what time will 15 men build it? *Ans.* 28 days.

16. If 15 men in 28 days build a wall, in how long time will it take 70 men to build it? *Ans.* 6 days.

NOTE.

Q. When the first and third terms, both or either, are composed of different denominations, what is to be done?

A. When the 1st and 3d terms are different, reduce both terms to the lowest denomination mentioned in either, before stating the question.

Q. When the second term consists of different denominations, what is to be done with it?

A. When the 2d term is of a different denomination, reduce it to the lowest denomination mentioned; the fourth term will then be found in the same denomination, and must be brought to the highest denomination possible.

Q. After division, if there be a remainder, and the quotient be not in the lowest denomination, what must be done with it?

A. If there be a remainder, it must be reduced to the next less denomination, dividing as before; and so proceed till it is brought to the lowest denomination, or till nothing remains.

Q. Should the product of the second and third terms be less than the first, what is to be done?

A. When the product of the 2d and 3d terms is less, reduce the second term to the next lower denomination, &c.

Q. When any number of barrels, bales, or other packages, or pieces, &c. are given, what is the method of procedure?

A. When bbls. &c. are given, if they be of equal contents, find the content of one barrel, piece, &c. in the lowest denomination mentioned, which multiply by the number of barrels, pieces, &c. the product will be the contents of the whole. But if they be of unequal contents, find the content of each, add them together, and the amount of them will be the whole quantity.

EXAMPLES.

17. If 1 cwt. of sugar cost $11,20, what will 2 cwt. 1 qr. 20 lb. cost at that rate ?

```
       cwt.                cwt. qr. lb.
        1                   2   1   20
        4                   4
        -                   -
        4 qr.               9 qr.
       28                  28
     -----                 --
     112 lb.               92
     -----                18
                          ---
                          272 lb.
                          ---
```

Here as 112 lb. is to $11,20, so is 272 lb. to $27,20.

```
              lb.      $        lb.
              112 : 11,20 :: 272
                      272
                     ----
                      224
                     784
                    224
                    ------        $
           112)3046,40(27,20 Ans.
               224
               ---
                806
                784
                ---
                 224
                 224
                 ---
                   0
                 ---
```

Note 1st.—As the number for the third term contains different denominations, both numbers for the first and third terms are reduced to the lowest denomination mentioned, before stating the question.

Note 2d.—As two places for cents are pointed off in the second term, the same number is pointed off in the product of the second and third terms; so, in dividing, the separatrix in the quotient must be made, before the first figure, at the right of the separatrix, is brought down.

Note.—In Single Proportion, make the separatrix between dollars and cents according to the directions for pointing off in Multiplication and Division of Federal Money.

18. What will 1 cwt. of sugar cost, if 2 cwt. 1 qr. 20 lb. cost $27.20? *Ans.* $11,20.

19. If $27.20 buy 2 cwt. 1 qr. 20 lb. of sugar, how much sugar will $11,20 buy?

```
        cwt.qr.  lb.
         2   1   2 0
         4
         -
         9 qr.
       2 8
      ----
       9 2
     1 8
     -----
     2 7 2 lb.
     -----
```

Here as $27,20 is to 272 lb., so is $11,20 to 112 lb.

```
         $           lb.          $
     2 7,2 0 : 2 7 2 : : 1 1,2 0
               1 1,2 0
               -------
               5 4 4
             2 7 2
           2 7 2
           -----------  lb.
 2 7,2|0)3 0 4 6,4|0(112 Answer in
         2 7 2           pounds which
         -----           must be re-
           3 2 6         duced back to
           2 7 2         the highest
           -----         denomination,
             5 4 4       thus,
             5 4 4              4
             -----       28)112(4
                            112 -
                            —— 1 cwt. An.
                                 -
```

Note.—As the number to be made the second term consists of several denominations, it is reduced to the lowest denomination mentioned. Then, the question being stated, and the second and third terms multiplied together,—as the right hand place of cents both in the product and divisor are each composed of a cypher, they are cut off, which reduces the one equally with the other.

20. If $11,20 buy 1 cwt. of sugar, how much will $27,20 buy?

Here as $11,20 is to 1 cwt., so is $27,20 to 2 cwt. 1 qr. 20 lb.

```
              $       cwt,     $
           1 1,2 0 : 1 : : 2 7,2 0
                       2 7,2 0
                       ------- cwt.qr.  lb.
       1 1,2|0)2 7,2|0(2     1     2 0 Ans.
               2 2 4
               -----
                 4,8
                   4
               -----
       1 1,2)1 9,2(1 qr.
             1 1 2
             -----
               8,0
             2 8
             -----
     1 1,2)2 2 4,0(20 lb.
           2 2 4
           -----
               0
```

NOTE.—The places pointed off for cents, in the first and third terms, are equal; therefore, by multiplying and dividing, 2 cwt. is obtained in the quotient, and a remainder of 4,8 is left, which is reduced to the next less denomination by 4; then, by dividing again, 1 qr. is obtained, and a remainder of 8,0 is left, which is reduced to the next less denomination by 28; then, by dividing again, 20 lb. is obtained, which completes the answer.

21. If 26 oranges cost $1, what will 8 cost?

Here as 26 oranges is to $1, so is 8 oranges to the answer.

Or, more properly, as 13 oranges is to $1, so is 4 oranges to the answer.

```
   or.    $     or.
   2            2
   2 6    1     8
   ---          -
   1 3 :  1  :  4
          4
          -           $
     1 3)4,0  0(0,3 0 7 9/13 Ans.
         3 9
         ---
        1 3)1 0 0(7 m.
              9 1
              ---
                9
```

Note.—Here the first and third terms are divided by 2, (which reduces them equally,) and their quotients used instead of them; then, as the product of the second and third terms is less than the first term, 2 cyphers are added, which is the same thing as reducing the second term from dollars to cents; then, after dividing, there is a remainder of 10, to which one cypher is added, which is the same as reducing it to mills; then, after dividing, there is a remainder of 9, which, with the divisor, forms the fraction.

22. If $\$0,307\frac{9}{13}$ buy 8 oranges, how much will it take to buy 26?

Here as the first and third terms are divided by 2, the 13 produced from the third term is not used, it being the same as the denominator of the fraction.

$$\begin{array}{lclcl}
\text{or.} & & \$ & & \text{or.} \\
2 & & & & 2 \\
8 & : & 0,307\frac{9}{13} & :: & 26 \\
\overline{} & & 13 & & \overline{} \\
4 & & \overline{} & & 13 \\
\overline{} & & 930 & & \overline{} \\
 & & 307 & & \\
 & & \overline{} & & \\
 & & 4)4,000 & & \\
 & & \overline{} & & \\
 & & \$1,000\ \textit{Ans.} & & \\
 & & \overline{} & &
\end{array}$$

Note.—As there is a fractional part of mills in the second term, reduce it to nine thirteenths of mills, by multiplying the cents and mills by the denominator, and adding in the numerator; then, as the third term is 13, exactly like the denominator of the fraction, omit it, and divide by 4 the first term, and $1 the answer is obtained.

23. If $1 buy 26 oranges, how many will $\$0,307\frac{9}{13}$ buy?

$$\begin{array}{lclcl}
\$ & & \text{or.} & & \$ \\
1 & : & 26 & :: & 0,307\frac{9}{13} \\
13 & & & & 13 \\
\overline{} & & & & \overline{} \\
13 & & & & 930 \\
\overline{} & & & & 307 \\
 & & & & \overline{} \\
 & & & & 4,000 \\
 & & & & 26 \\
 & & & & \overline{} \\
 & & & & 13)104,000(8\ \text{or.}\ \textit{Ans.} \\
 & & & & 104 \\
 & & & & \overline{}
\end{array}$$

Note.—As the third term is multiplied by the denominator of the fraction, so also is the first term; then, after dividing, (there being no remainder,) the 3 cyphers at the right hand of the whole numbers are omitted, as they are pointed off as decimals.

24. If $$0,307\frac{9}{13}$ buy 8 oranges, how many will $1 buy?

```
 $              or.   $
0,3 0 7 9/13 : 8 : :  1
    1 3              1 3
   -----             ---
  9 3 0              1 3
3 0 7                  8
-------           -------
4,0 0 0           4)1 0 4
-------             -----
                      2 6 or. Ans.
```

Note.—As the first and third terms are both multiplied by the denominator of the fraction, which increases them equally, so in dividing by 4, as the 3 cyphers are pointed off as decimals, they are omitted.

25. If 175 pieces of India cotton cost $1924,65, and each piece contain 39 yards, what does it cost a yard?

```
1 7 5 pieces.
  3 9 yd. in a piece.
-------
1 5 7 5
5 2 5
-------
6 8 2 5 yd. in the 175 pieces.

 yd.         $             yd. $
6 8 2 5 : 1 9 2 4,6 5 : : 1 (0,2 8 2 Ans.
          1 3 6 5 0
          -----------
            5 5 9 6 5
            5 4 6 0 0
            -----------
              1 3 6 5 0
              1 3 6 5 0
              ---------
```

Note.—Reduce the number of pieces to yards for the first term; then, as the third term is 1 yd., omit it, and divide the second by the first.

26. If $0,282 buy 1 yd. of American cotton, how many pieces, each containing 39 yd. will $1924,65 buy?

```
 $        yd.       $          (39)
0,2 8 2 : 1 : : 1 9 2 4,6 5 (6 8 2 5(1 7 5 ps. Ans.
                1 6 9 2      3 9
                ---------    -----
                  2 3 2 6    2 9 2
                  2 2 5 6    2 7 3
                  -------    -------
                    7 0 5      1 9 5
                    5 6 4      1 9 5
                    -------    -----
                    1 4 1 0
                    1 4 1 0
                    -------
```

Note.—As the second term is 1 yd., omit it, and divide the third by the first, and it gives the fourth in yards, which divided by the number of yards in a piece, gives the number of pieces.

27. If 1 yd. of Irish linen cost $0,282, what will 175 pieces each containing 39 yd. cost?

```
 yd.  $          yd.
  1 : 0,2 8 2 : : 6 8 2 5
      6 8 2 5
      -------
      1 4 1 0
      5 6 4
  2 2 5 6
1 6 9 2
-----------
$1 9 2 4,6 5 0 Ans.
```

```
1 7 5 pieces.
  3 9 yd. in a piece.
-------
1 5 7 5
5 2 5
-------
6 8 2 5 yd. in the 175 ps.
```

Note.—Reduce the number of pieces to yards, for the third term; then, as the first term is 1 yd., omit it, and multiply the second term by the third.

28. If $1924,65 buy 175 pieces of American gingham each containing 39 yd., how much will $0,282 buy?

```
1 7 5 pieces.
  3 9 yd. in a piece.
-------
1 5 7 5
5 2 5
-------
6 8 2 5 yd. in the 175 pieces.
-------
```

```
          $               yd.        $
  1 9 2 4,6 5 : 6 8 2 5 : : 0,2 8 2
                0,2 8 2
              ---------
                1 3 6 5 0
              5 4 6 0 0
            1 3 6 5 0
            -------------
1 9 2 4,6 5|0) 1 9 2 4,6 5|0 ( 1 yd. Ans.
               1 9 2 4 6 5
               -----------
```

Note.—Reduce the number of pieces to yards for the second term; then, after multiplying the second and third terms together, annex a cypher to the divisor to make the number of decimals equal to those in the dividend.

29. If 7 yd. of broadcloth cost $9, what will 716 yd. cost? *Ans.* $920,57⅐.

30. If $920,57⅐ buy 716 yd. of cassimere, how much will $9 buy? *Ans.* 7 yd.

31. Nine boarders paid their host, each $3 a week: What did they, all together, pay a year? *Ans.* $1404.

32. Nine men pay $1404 a year for board: What does each of them pay a week? *Ans.* $3.

33. If you lend a friend $700 for 9 months, and he afterwards lends you $1200; how long may you keep it to balance the favour? *Ans.* 5 months, 7½ days.

34. A. borrowed of B. $1200 for 5 months, 7½ days; afterwards, B. borrowed of A. a sum of money for 9 months: How much money did B. borrow of A. to balance the favour? *Ans.* $700.

35. What are plumbs a quart, at $2,88 a bushel? *Ans.* $0,09.

36. How many plumbs can I have for $2,88, at nine cents a quart? *Ans.* 1 bushel.

37. What will 18¾ cwt. of Muscovado sugar cost, at $0,12½ a pound? *Ans.* $262½.

38. How much Havana sugar can I have for $262½, at $0,12½ a pound? *Ans.* 18¾ cwt.

39. What will 7 Great gross of buttons cost, at twenty-five cents a dozen? *Ans.* $252.

40. How many buttons can you buy for $0,25, if seven Great gross cost $252? *Ans.* One dozen.

41. If $100 gain $6 interest in a year, what principal will gain the same in 1½ month? *Ans.* $800.

42. If $800 gain $6 interest in 1½ month, how long will $100 be gaining the same? *Ans.* One year.

43. If $100 gain $6 interest in a year, what will $7695 gain in the same time? *Ans.* $461,70.

44. If $7695 gain $461,70 interest in a year, what is the rate per cent.? *Ans.* $6.

Note.—In the above sum, make $100 the third term.

45. How many days' work can you hire for $279, at seventy-five cents a day? *Ans.* 372.

46. A farmer paid $279 for 372 days' work: How much was that a day? *Ans.* $0,75.

47. The President of the U. States, receives a salary

of twenty-five thousand dollars a year: What is that a month? *Ans.* \$2083$\frac{1}{3}$.

48. A merchant purchased goods to the amount of \$8400, and thereby gained \$630: How much would he gain by laying out \$2600 at the same rate? *Ans.* \$195.

49. If a merchant, by laying out \$8400, gain \$630; how much money must he lay out to gain \$195? *Ans.* \$2600.

50. If a man, who can travel 22 miles in a day, perform a journey in 16 days, how long will it take another man who can travel 39 miles a day, to perform the same journey? *Ans.* 9$\frac{1}{39}$ days.

51. If a man who can travel 22 miles in a day, perform a journey in 16 days; how far must he travel a day, to perform it in 9$\frac{1}{39}$ days? *Ans.* 39 miles.

52. The number of newspapers issued annually in the U. States, is 23,150,000: How many is that a day, allowing 365 days to the year? *Ans.* 63424$\frac{240}{365}$.

53. The public journals issued annually in Great Britain, amount to 20500000: How many is that a week? *Ans.* 394230$\frac{10}{13}$.

Note.—In the answer of the above sum, reduce the fraction to its lowest terms.

54. If 2 qr. 16 lb. of cheese cost \$8$\frac{1}{2}$, what will 7 cwt. 3 qr. come to? *Ans.* \$102,47$\frac{16}{72}$.

55. If \$102,47$\frac{16}{72}$ buy 7 cwt. 3 qr. of butter, how much will \$8$\frac{1}{2}$ buy? *Ans.* 2 qr. 16 lb.

56. There are 190 paper-mills in the U. States, which manufacture annually 340000 reams of paper: To what will it amount at \$0,12075 a quire? *Ans.* \$821100.

57. If \$8.75 pay for the conveyance of 3 cwt. 2 qr. 200 miles, how far may 19 cwt. be conveyed for the same money? *Ans.* 36 M. 6 fur. 7 ch. 1 rd. 11$\frac{18}{19}$ lk.

58. A. owes B. \$7250; but B. compounds with A. for \$0,805 on the dollar: How much does B. receive for his debt? *Ans.* \$5836,25.

59. A. failing in trade, owes B. \$7250, of which B. loses \$1413,75: How much does B. lose on the dollar? *Ans.* \$0,195.

60. A bankrupt owes \$25000, and his goods and effects are worth only \$7975: How much will a creditor receive on the dollar? *Ans.* \$0,319.

61. What is the price of 7 pieces of satinet; the first piece containing 84 yds. the second 70 yds. the third 59 yds. the fourth 45 yds. the fifth 33 yds. the sixth 26 yds. and the seventh 17 yds. at $2,909 a yard?

Ans. $971,606.

62. If 1½ cords of wood cost $3,375, what will 60¼ cords cost? *Ans.* $135,5625.

63. If a staff 4 ft. in length, cast a shade, on level ground 6 ft. 8 in., how high is that steeple, whose shade at the same time measures 275 ft.? *Ans.* 165 ft.

64. A gentleman sent a ship on a whaling voyage, and agreed to divide the proceeds of the voyage into 50 shares; the ship returned with a cargo worth $9000, and the captain received 8 shares: What was the value of his part of the cargo? *Ans.* $1440.

65. In Ceylon, a bundle of cinnamon is 4 ft. in length, and weighs 88 lb.; how many bundles of it make a ton?

Ans. 25 bundles, and 40 lb.

66. In Honduras, a single Mahogany tree has been known to contain 12000 ft.; and to produce $4440: How many trees, each measuring 300 ft., will contain the same quantity; and what did it produce a foot?

Ans. { 40 trees.
{ $0,37 a foot.

NOTE.—In the above sum, find the answers by making two separate statements.

67. An acre of land has been asserted to produce 50 lb. of opium, and 60000 lb. are annually exported from the Ganges; a single seed-vessel of the white poppy has contained 30000 seeds: What is the value of opium from the acre at $15,39 a pound? *Ans.* $769,50.

68. In the month of Oct. 1820, the Androscoggin river (Maine,) suddenly rose 25 ft. perpendicular height, and broke all the booms above the Falls, containing logs sufficient to supply 23 saws for two years: How long would the logs be sufficient to supply 4 saws; and how long would they be sufficient to supply one saw?

Ans. { 4 saws 11½ years.
{ 1 saw 46 do.

69. The salt Prairie near the tribe of Osage Indians, being about 1300 miles, (by the course of the river,) above the village of Arkansas, is covered, for many miles,

5 in. deep, with pure, white, crystalized salt; and a piece may be cut and split off a foot square: How many bushels of salt are there in a mile square?

Ans. 9334285† bushels.

NOTE.—In the above sum, make the number of cubic inches in a bushel the first term.

70. How much cider can be made in 20 years from an orchard consisting of 9 rows, each containing 15 trees, if 67 gallons can be made from each tree yearly?

Ans. 717 tuns, 1 P. 1 hhd. 27 gal.

71. If my salary be $1200 a year, how much is it a week? *Ans.* $23,076$\frac{48}{52}$.

72. How many yards of carpeting ¾ of a yard wide, will it take to cover the floor of a room 27 ft. in length, and 21 ft. in breadth? *Ans.* 84 yd.

NOTE.—In the above sum, reduce the area of the floor to quarters for the third term.

73. How much in length, that is 1½ in. in width, will make a square foot? *Ans.* 8 ft.

74. What is the price of a plank, 30 ft. in length, and 1 ft. 8 in. in width, at four cents a ft.? *Ans.* Two dollars.

75. A garrison of soldiers, consisting of 1000 men, is to be clothed; each suit to contain 7¼ yds. of cloth which is 1½ yds. wide, and lined with baize ¾ of a yard wide: How many yards of baize will complete the lining of the whole? *Ans.* 14500 yd.

76. A. and B. depart from the same place, and travel the same road; but B. goes 6 days before A., at the rate of 15 miles a day; A. follows at the rate of 20 miles a day: What distance must A. travel to overtake B.?

Ans. 360 miles.

NOTE.—In the above sum, make the number of miles which A. will travel in 6 days the third term, and the number of miles which A. will gain in a day, the first term.

77. A hound starts a hare, being 9 rods behind, and runs 18 rods to the hare's 14: How far must the hare run before the hound overtakes her? *Ans.* 31½. rd.

78. Peter had pears, 27 of which were worth 9 cents, and made an exchange with Harry who had apples, 24 of which were worth two cents: How many apples did Harry give Peter for 30 pears? *Ans.* 120.

79. If you mix 40 bushels of wheat with rye, so that

every bushel contains 10 quarts of wheat; how many bushels of rye are contained in the mixture?

Ans. 88 bu.

80. If you have deferred stock to the amount of $750, and it is worth but $0,75 on the dollar; what is the worth of the whole stock? *Ans.* $562½.

81. A draper bought 12½ pieces of India crape, each containing 26¾ yd., at $1,90 a yard: What was the whole value? *Ans.* $635,3125.

NOTE.—In the above sum, reduce the fractions to decimals.

82. A merchant bought a bale of cloth containing 360 yd. at $1,625 a yard, and sold it at the rate of $10½ for 8 yd.: Did he gain or lose? *Ans.* Lost $112½.

NOTE.—In the above sum, first find the amount which the cloth cost, and then the amount for which it sold.

83. A factor bought a quantity of broadcloth and baize, which cost $350; the quantity of broadcloth being 80 yd. at $2½ a yard; and for every 4 yd. of broadcloth he had 7 yd. of baize: How many yards of baize did he buy; and what did it cost him a yard?

Ans. { 140 yd.
Cost $1,07$\frac{2}{14}$ a yard.

84. A goldsmith sold a silver tankard for $24½, at ninety cents an ounce: What was the weight of it.

Ans. 2 lb. 3 oz. 4 pwt. 10⅔ gr.

85. If a farmer hire 2 men and 2 boys to do a job of work, and one of the men can do it in 4 days, and the other in 6 days; one of the boys can do it in 8 days, and the other in 12 days: In what time will they do the job, if they all work together? *Ans.* 1,6 days.

NOTE.—In the above sum, suppose 30 days, (or any other convenient number,) for the third term; then, by making four separate statements, find how many jobs each one can do in the supposed number of days; lastly, make the amount of the jobs the first term of a fifth statement, and the supposed number of days the second term.

86. A merchant bought 10000 bushels of Salina salt for $2000; and he paid $700 for freight; $300 duties; other charges $500; and he gained $1900: At how much did he sell it a bushel? *Ans.* $0,54.

87. A certain cistern has 4 tubes; the first will empty it in 1 hour, the second in 4 hours, the third in 6 hours, and the fourth in 10 hours: In what time will all of them running together, empty the cistern?

Ans. 39 m. 33,626† sc.

NOTE.—In the above sum, pursue the same principle as in the 85th sum.

88. If 120 gal. of water fall into a cistern containing 1½ Pipes, in 1 hour; and by a tube, 30 gal. run out in the same time: In what time will the cistern be filled? *Ans.* 2 h. 6 m.

89. The earth is 360 degrees in circumference, and it turns round on its Axis once in 24 hours: How far does it turn in 50 minutes, in the 43d parallel of Latitude: The degree of Longitude in this Latitude is about 51 statute miles? *Ans.* 12 deg. 25½ m.

NOTE.—In the above sum, after finding the degrees, reduce the remainder by 51 miles.

90. If your horse and chaise be worth 36 Eagles, and your horse is worth 5 times as much as your chaise; what is the value of your horse? *Ans.* $300.

NOTE.—In the above sum, say, as 6 is to 1, so is 36 to the value of the chaise.

91. If your purse and money be worth $63, and your money is worth 14 times as much as your purse: How much money have you? *Ans.* $58,80.

92. A butcher bought oxen at $45; cows at $24; calves at $4; and sheep at $2 each: How many did he purchase of each an equal number in laying out $6000? *Ans.* 80.

93. A garrison of 800 men has provisions for 6 months, at the rate of 12 ounces a day: How long will the provisions last at the same allowance, if the garrison be reinforced by 600 men? *Ans.* 3$\frac{3}{7}$ mo.

94. Nine hundred soldiers were stationed in a garrison, and their provisions were calculated sufficient for 4 months: How many soldiers must depart, so that the provisions may last 9 months? *Ans.* 500.

95. Forty rods in length, and 4 rods in breadth, make an acre: How many rods in breadth, that is 15 rods in length, will make an acre? *Ans.* 10⅔ rd.

96. If your watch strike four, in what time will the minute hand cross the hour hand? *Ans.* 21 m. 49$\frac{5}{11}$ sc.

NOTE.—In the above sum, say, as 55 m. is to 5 m. so is 4 h. to the answer.

97. The earth performs its diurnal revolution in a solar day: In what time does it move 4½ degrees? *Ans.* 18 m.

NOTE.—In the above sum, make 360 deg. the first term, and 24 h. the second.

98. What is the price of a ship, if $\frac{6}{10}$ of her be worth $900? *Ans.* $1500.

NOTE.—In the above sum, make the numerator of the fraction the first term, and the denominator the third.

99. If a vessel be worth $800, what is the value of $\frac{5}{16}$ of her? *Ans.* $250.

100. A grocer bought a hogshead of brandy for $78: How much will he gain, if 19 gallons leak out, and he sells the remainder at twenty-five cents a pint?

Ans. $10.

101. A merchant purchased 12 chests of tea, each weighing 2 cwt. 3 qr. 20 lb., for $5274,24: How much did it cost him a pound? *Ans.* $1,34.

102. A gentleman's income is $3000 a year, and he spends 4\frac{1}{2}$ a day on an average: How much has he remaining at the close of the year, allowing 365$\frac{1}{4}$ days to the year? *Ans.* $1356,375.

103. The different species of taxable property and amount of the grand list of the State of Connecticut in 1817, were as follows, viz. list of polls, $1718490; cattle, horses and mules, $1464597,26; lands, houses, and stores, $1795882,79; riding carriages, $74628; watches and clocks, $159488; money at interest, bank stock, and plate, $136423,22; assessments for faculties, $229977,10; half fourfolds, $7873,18: What was the amount of the taxes, at ten cents on the dollar? *Ans.* $558735,955.

NOTE.—In the above sum, find the whole amount of the grand list, and place it for the third term.

104. If the grand list of a State be $5587359,55, how much tax must a town pay, the value of whose inventory is $52953,78, at ten cents on the dollar?

Ans. $5295,378.

105. If the inventory of all the estates in a town amount to $52953,78, and a tax of $5295,378 is laid on the town; how much tax must a man pay, whose estate amounts to $1250,25; and how much does he pay on the dollar?

Ans. { $125,025 tax.
$0,10 on the dollar.

106. If the General Assembly of a State grant a tax of three mills on the dollar; how much must a man pay, who is 460\frac{1}{2}$ on the list? *Ans.* $1,3815.

107. A landholder has owing him from 4 tenants $60, of which A. agrees to pay $\frac{1}{3}$, B. $\frac{1}{4}$, C. $\frac{1}{5}$, D. $\frac{1}{6}$: how much is each tenant's share to pay ?

SIMPLE INTEREST.

Q. What is Interest ?

A. Interest is a premium given by the borrower, to the lender of money, for the use of it.

Q. How is interest computed ?

A. Interest is computed at so much per cent., *i. e.* at so many dollars for each hundred lent for a year ; and a like proportion, for a greater or less time.

Q. What is the rate per cent. by law ?

A. The rate of interest in most of the U. States, is established at 6 per cent., *i. e.* $6 for the use of $100 for one year. In some States, the rate is 7 per cent.

Q. What are the Terms in Interest ?

A. The Terms in Interest are, *Principal*, *Interest*, *Amount*, *Per Cent.* or *Centum*, and *Per Annum*.

Q. What is understood by the Terms ?

A. By *principal*, is understood, the money lent ; by *interest*, the rate per cent. agreed on ; by *amount*, the principal and interest added together ; by *per cent.*, by the hundred ; by *per annum*, by the year.

CASE I.

RULE.

Q. When the interest of any sum is required for one year, how do you proceed ?

A. In finding the interest for a year, multiply the principal by the rate per cent., and remove the *separatrix* from its natural place two figures towards the left hand, then all those figures to the left hand will be dollars, and those to the right hand will be cents, mills, and parts of a mill.

EXAMPLES.

Note.—The method of proceeding in Simple Interest illustrated.

1. What is the interest of $75,50, for one year, at 6 per cent. per annum ?

$
7 5,5 0 principal.
6 per cent.
$4,5 3 0 0 *Ans.*

NOTE.—To find the interest of the sum here given, multiply the principal by the rate per cent. and point off two more places in the product for decimals than the number of decimals contained in the principal.

2. What is the interest of $100, for one year, at 6 per cent. per annum? *Ans.* $6.

3. What is the interest of $1965,758, for one year, at 6 per cent.? *Ans.* $117,94548.

4. What is the interest of $10,09, for one year, at 6 per cent.; and how much, at 7 per cent. per annum?

Ans. { $0,6054 at 6 per cent.
$0,7063 at 7 per cent.

5. What is the interest of $0,967, for one year, at 6 per cent.? *Ans.* $0,05802.

6. What is the interest of $1965,758, for one year, at 7 per cent.? *Ans.* $137,60306.

7. What is the interest of five dollars, eight cents, for one year, at four per cent.? *Ans.* $0,2032.

CASE II.

RULE.

Q. When the interest of any sum is required for either a greater or less time than one year, how do you proceed?

A. In finding the interest for more or less than one year, multiply the interest of one year, by the number of years. For months, take the aliquot parts of a year. For days, take the aliquot parts of a month, allowing 30 days to the month.

TABLE OF ALIQUOT PARTS OF TIME.

At 12 months to the year.			At 30 days to the month.		
mo.		*yr.*	*d.*		*mo.*
6	is	$\frac{1}{2}$	15	is	$\frac{1}{2}$
4	—	$\frac{1}{3}$	10	—	$\frac{1}{3}$
3	—	$\frac{1}{4}$	6	—	$\frac{1}{5}$
2	—	$\frac{1}{6}$	5	—	$\frac{1}{6}$
1½	—	$\frac{1}{8}$	3	—	$\frac{1}{10}$
1	—	$\frac{1}{12}$	2	—	$\frac{1}{15}$

EXAMPLES.

1. What is the interest of $247,19, for 3 years, at 6 per cent.?

Operation.

$	
247,19	principal.
6	per cent.
14,8314	interest for 1 year.
3	years.
$44,4942	*Ans.*

2. What is the interest of $941,80, for 7 years, at 6 per cent.? *Ans.* $395,556.

3. What is the interest of $941,80, for 7 years, at 7 per cent.? *Ans.* $461,482.

4. What is the interest of $941,80, for 7 years, at 3½ per cent.? *Ans.* $230,741.

5. What is the interest of $1000,94, for 21 years, at 7 per cent.? *Ans.* $1471,3818.

6. What is the interest of $276,455, for 4 years, 8 months, and 5 days, at 6 per cent.?

	$	
	276,455	principal.
	6	rate per cent.
6 months $\frac{1}{2}$)	16,58730	interest for 1 year.
	4	years.
	66,34920	interest for 4 years.
2 months $\frac{1}{3}$)	8,29365	interest for 6 months.
5 days $\frac{1}{12}$)	2,76455	interest for 2 months.
	,23037	interest for 5 days.
	$77,63777†	*Ans.*

Note.—In this sum, first find the interest for 1 year, and then for 4 years, divide the interest of 1 year by 2, and it gives the interest for 6 months; divide the interest of 6 months by 3, and it gives the interest for 2 months; divide the interest of 2 months by 12, and it gives the interest for 5 days: lastly, add the interest of 4 years, 6 months, 2 months, and 5 days together, which will be the answer.

7. What is the interest of $84,094, for 2 yr. 9 mo. 20 d. at 6 per cent.? *Ans.* $14,155.†

8. What is the interest of $762,97, for 5 yr. 11 mo. 9 d., at 6 per cent.? *Ans.* $271,998.†

9. What is the interest of $2000, for 5¼ years, at 7 per cent.? *Ans.* $770.

10. What is the interest of $100,10, for 6 yr. 5 mo. 27 d., at 7 per cent.? *Ans.* $45,487.†

11. What is the interest of $100,10, for 6 yr. 5 mo. 27 d., at 6 per cent.; and also, at 8¼ per cent.?

Ans. { $38,988† at 6 per cent.
$55,234† at 8½ per cent.

12. What is the interest of $1, for 11 yr. 7 mo. 17 d., at 6 per cent.; and also, at 7 per cent.?

Ans. { $0,697† at 6 per cent.
$0,814† at 7 per cent.

13. What is the interest of $340,67, for 2 yr. 8 mo. 24 d., at 7 per cent.? *Ans.* $65,181.†

14. What is the interest of $791,62, for 7 yr. 3 mo. 19 d., at 7 per cent.? *Ans.* $404,671.†

15. What is the interest of $47,214, for 3 yr. 6 mo. 29 d., at 7 per cent.? *Ans.* $11,833.†

16. What is the interest of $156,905, for 4 years, at 6½ per cent.? *Ans.* $40,795.†

17. What is the interest of $19,85, for 9¾ years, and 10 days, at 7½ per cent.? *Ans.* $14,556.†

18. What is the interest of $222,222, for 6 yr. 3 mo. 20 d., at 5 per cent.? *Ans.* $70,061.†

19. What is the interest of $69,015, for 3 yr. 2 mo. 4 d., at 12½ per cent.? *Ans.* $27,414.†

20. Find the interest of $0,815, for 12 yr. 1 mo. 15 d. at 4½ per cent.? *Ans.* $0,444.†

ANOTHER METHOD.

The following method of computing Interest, when the rate is 6 per cent. is, perhaps, preferable to any other, for conciseness and facility.

CASE I.

RULE.

Q. How do you proceed in computing interest by this method?

A. To reckon interest in the concisest manner, write down half the greatest even number of months, directly under the highest decimal figure of the principal, for a multiplier; if there be an odd month, reckon it 30 days, to which, add the given days (if any;) divide their amount by 6, and place the quotient, for a decimal, at the right hand of half the even number of months, as a part of the multiplier, by which, (multiplier,) multiply the principal; point off two more places for decimals in the product, than there are decimal places in both the multiplicand and multiplier; then all the figures to the left hand of the separatrix will be dollars, and those to the right hand, will be cents, mills, &c. which will be the interest required.

Q. If there be a remainder in taking one sixth of the days, how do you proceed?

A. If there be a remainder in taking the one sixth of the days, reduce the remainder to a vulgar fraction; for which take aliquot parts of the multiplicand: Thus,

If the remainder be $1=\frac{1}{6}$, divide the multiplic. by 6.
If — — $2=\frac{1}{3}$, — — by 3.
If — — $3=\frac{1}{2}$, — — by 2.
If — — $4=\frac{2}{3}$, — — by 3 twice.
If — — $5=\frac{1}{2}$ and $\frac{1}{3}$, — — by 2 and 3.

The quotients which occur in this way, being added to the rest of the interest, give the interest required.

Q. When the given number of days is less than 6, how do you proceed?

A. When the given days are less than 6, put a cypher in place of the decimal at the right hand of half the even number of months, and proceed as above directed.

EXAMPLES.

NOTE.—The method of proceeding in the *new* rule of Interest illustrated.

1. What is the interest of \$95,36, for 1 yr. 5 mo. 17 d., at 6 per cent.?

$
5 days, ½ and ⅓)95,36 principal.
8,7 the 8 is half the even number of mo., and the 7 a decimal for 42 d.
———
66752 interest for the odd month, and 12 d. over.
76288 do. for 1 yr. 4 mo.
4768 do. for 3 days.
3178 do. for 2 days.
———
$8,37578† *Ans.*
———

Note.—In this sum, first find the interest for 42 days by multiplying the principal by the decimal 7; then find the interest for 16 months by multiplying the principal by the 8; next find the interest for 3 days by dividing the principal by the fraction ½; lastly, find the interest for 2 days by dividing the principal by the fraction ⅓, and add all the parts of the interest together, which gives the answer.

2. What is the interest of $10,91, for 1 yr. 9 mo. 10 d.? *Ans.* $1,163.†

3. What is the interest of $6, for 11 mo. 29 d.? *Ans.* $0,359.

4. What is the interest of $430,065, for 7 mo. 21 d.? *Ans.* $16 557.†

Note.—When there are *mills* in the principal, it will extend one place farther to the right than the multiplier; in this case, place the first figure of the product directly under the figure of the principal from which it is obtained.

5. What is the interest of $1,20, for 2 mo. 5 d.? *Ans.* $0,013.

6. What is the interest of $0,925, for 20 yr. 1 mo. 1 d.? *Ans.* $1,114.†

7. Required the interest of $60,90, for 16 yr. 8 mo. *Ans.* $60,90.

8. Find the interest of $519,115, for 3 yr. 4 mo. 16 d. *Ans.* $105,207.†

9. What is the interest of $79,105, for 26 days? *Ans.* $0,342.†

10. What is the interest of $28,04, for 1 mo. 22 d.? *Ans.* $0,243.†

11. What is the interest of $112,125, for 1 yr. 2 mo. 3 d.? *Ans.* $7,904.†

12. What is the interest of $68, for 9 mo. ?
Ans. $3,06.

13. What is the interest of $1500, for 1 yr. 11 mo. ?
Ans. $172,50.

14. What is the interest of $9416,14, for 29 days ?
Ans. $45,511.†

15. What is the interest of fifty cents, for 8 yr. 4 mo. ?
Ans. $0,25.

16. What is the interest of $50,50, for 5 yr. 5 mo. 5 d. ?
Ans. $16,454.†

CASE II.

RULE.

Q. When the rate is any other than 6 per cent., how do you proceed ?

A. Find the interest at 6 per cent., and divide it by such parts as the interest at the rate required, exceeds or falls short of the interest at 6 per cent., and the quotient added to, or subtracted from, the interest at 6 per cent., (as the case may be,) will give the interest at the rate required.

EXAMPLES.

1. What is the interest of $486,73, for 1 yr. 7 mo. 18 d., at 7 per cent. ?

Operation.

$
4 8 6, 7 3 principal.
9, 8
3 8 9 3 8 4 interest for the odd month, and 18 [days over.
4 3 8 0 5 7 interest for 1 yr. 6 mo.
⅙)4 7, 6 9 9 5 4 interest of 6 per cent.
7, 9 4 9 9 2 interest of 1 per cent.
$5 5, 6 4 9 4 6† *Ans.*

Note.—Find the interest at 6 per cent. ; then divide the interest of 6 per cent. by 6, which will give the interest of 1 per cent. ; lastly, add the interest of 6 per cent. and the interest of 1 per cent. together, and their amount will be 7 per cent., the answer required.

2. What is the interest of $450,78, for 9 m. 13 d., at 4 per cent. ?

$
1 day $\frac{1}{6}$)4 5 0, 7 8 principal.
4, 7 [and 12 days over.
3 1 5 5 4 6 interest for the odd month,
1 8 0 3 1 2 do. for 8 m.
7 5 1 3 do. for 1 day.

2 per cent. $\frac{1}{3}$)2 1, 2 6 1 7 9 do. of 6 per cent.
7, 0 8 7 2 6 do. of 2 per cent.

$1 4, 1 7 4 5 3 *Ans.*

NOTE.—Find the interest at 6 per cent.; then divide the interest of 6 per cent. by 3, which will give the interest of 2 per cent.; lastly, subtract the interest of 2 per cent. from the interest of 6 per cent. and their difference will be 4 per cent., the answer required.

3. What is the interest of $99,65, for 2 yr. 3 mo. 20 d., at 7 per cent. ? *Ans.* $16,082.†

4. What is the interest of $119,405, for 1 yr. 10 m. 2 d., at 7½ per cent. ? *Ans.* $16,467.†

5. What is the interest of $0,875, for 30 years, at 5 per cent. ? *Ans.* $1.3125.

6. What is the interest of $1700, for 4 mo. 28 d., at 8 per cent. ? *Ans.* $55,911.†

7. What is the interest of $27, for 3 yr. 4 d., at 3½ per cent. ? *Ans.* $2,845.†

8. What is the interest of $7,43, for 6 yr., at 12 per cent. ? *Ans.* $5,3496.

9. What is the interest of $0,445, for 1 mo. 29 d. at 10 per cent. ? *Ans.* $0,007293.†

10. What is the interest of $10,66, for 4 yr. 2 mo. 15 d., at 6 per cent. ? *Ans.* $2,69165.

11. What is the interest of $321,80, for 2 m. 2 d., at seven per cent. ? *Ans.* $3,879.†

12. What is the interest of $50,95, for 10 m. 10 d., at 7½ per cent. ? *Ans.* $3,29.†

13. What is the interest of $33,50, for 1 yr. 7 m. 25 d., at 7 per cent. ? *Ans.* $3,875.†

14. What is the interest of $660,75, for 1 yr. 5 m. 20 d., at 7 per cent. ? *Ans.* $68,093.†

15. What is the interest of seven dollars, nine cents, at six and three-fourths per cent. for five years and one day? *Ans.* $2,394.†

CASE III.

RULE.

Q. How do you proceed to find the intermediate time, from one date to another?

A. To find the time from one date to another, set down the last mentioned year, the number of the months, and days; then place the first mentioned time underneath, and subtract it from the last; the remainder will be the intermediate time.

EXAMPLES.

1. What is the intermediate time, from Oct. 17th, 1820, to July 14th, 1821?

Operation.

	yr.	m.	d.	
	1821	6	14	Last mentioned time.
	1820	9	17	First mentioned time.
Intermediate time,		8	28	*Ans.*

Note.—Borrow from the whole number of days, contained in the given month, in the first mentioned time.

2. What is the intermediate time, from May 20th, 1819, to April 4th, 1821? *Ans.* 1 yr. 10 m. 15 d.

3. What is the intermediate time, from Nov. 2d, 1818, to Nov. 1st, 1821? *Ans.* 2 yr. 11 m. 29 d.

Note.—In the above sum, borrow from the whole number of days, contained in the given month, in the first mentioned time.

Note.—In the following questions, the 2d and 3d Cases are blended together.

4. What is the interest of $75,33, from Oct. 17th, 1820, to July 14th, 1821, at 6 per cent.? *Ans.* $3,36474.

5. What is the interest of $200, from May 20th, 1819, to April 4th, 1821, at 7½ per cent.? *Ans.* $28,125.

6. What is the interest of $796,67, from Nov. 2d, 1818, to Nov. 1st, 1821, at 7 per cent.? *Ans.* $167,145.†

7. What is the interest of $492,48, from June 1st, to Dec. 20th, at 6 per cent.? *Ans.* $16,33392.

8. What is the interest of $59,50, from August 12th, 1816, to March 10th, 1820, at 7 per cent.? *Ans.* $14,913.†

9. What is the interest of $170, from July 15th, 1817, to Oct. 9th, 1820, at 6 per cent.? *Ans.* $33,008.†

10. What is the interest of nine hundred twelve dollars, from Nov. 24th, 1820, to Oct. 15th, 1821, at six per cent? *Ans.* $48,792.

11. What is the interest of $80,05, from Dec. 20th, 1821, to Jan. 10th, 1822, at 1 per cent.? *Ans.* $0,04669.†

CASE IV.

RULE.

Q. How do you proceed, when the amount of any sum is required for a given time, and at a certain rate per cent.?

A. Find the interest at the given rate and time; then add the principal and interest together, and their sum will be the amount.

EXAMPLES.

1. What is the amount of $95,44, for 1 yr. 11 mo. 14 d., at 6 per cent.?

Operation.

$

2 days $\frac{1}{3}$) 9 5,4 4 principal.
1 1,7
[and 12 days over.
6 6 8 0 8 interest for the odd month,
9 5 4 4 } interest for 1 yr. 10 mo.
9 5 4 4 }
3 1 8 1† interest for 2 days.

1 1,1 9 8 2 9† interest total.
9 5,4 4 principal to be added.

Amount, $1 0 6,6 3 8 2 9† *Ans.*

Note.—Find the interest at the given rate per cent. and add the principal to it.

2. What will be the amount of $75,33, for 9 mo. 28 d., at 6 per cent.? *Ans.* $79,07139

3. What will be the amount of $400,89, for 2 yr. 4 mo. 5 d. at 7 per cent. ? *Ans.* $466,758.†

4. What will be the amount of $36,36, for 8 yr. 4 mo. at 6 per cent. ? *Ans.* $54,54.

5. What will be the amount of $1000, for 4 yr. 3 mo., at 6 per cent. ; and how much at 7 per cent. ?

Ans. { $1255, at 6 per cent.
$1297,50 at 7 per cent.

6. What is the amount of $10,90, for 16 yr. 8 mo. at 6 per cent. ? *Ans.* $21,80.

7. To what will $10,90 amount, in 14 yr. 3 m. 13 d., at 7 per cent. ? *Ans.* $21,80.†

8. What will be the amount of $10,90, for 50 years, at 2 per cent. ? *Ans.* $21,80.

9. What will be the amount of $10,90, for 10 yr. 6 mo. 10 d., at 9½ per cent. ? *Ans.* $21,80.†

10. What will be the amount of $0,015, for 21¾ years, at 12¼ per cent. ? *Ans.* $0,054965.†

11. What will be the amount of $45,79, from Dec. 21st, 1820, to Oct. 8th, 1821, at 6 per cent. ?
Ans. $47,98792.

12. What will be the amount of $71,975, from April 19th, 1817, to Sept. 24th, 1821, at 7 per cent. ?
Ans. $94,297.†

13. What will be the amount of $59,50, from August 12th, 1819, to March 10th, 1820, at 7 per cent. ?
Ans. $61,918.†

14. What will be the amount of $492,48, from June 1st, to Dec. 20th, at 5½ per cent. ? *Ans.* $507,452.†

15. What will be the amount of $30,03, from Nov. 30th, 1821, to Feb. 27th, 1822, at 6 per cent. ?
Ans. $30,465.†

16. What is the amount of $102,09, from Feb. 25th, 1820, to March 4th, 1822, at 7¾ per cent. ?
Ans. $118,089.†

NOTE.—In the above sum, the first mentioned time being Feb. in Leap Year, therefore, borrow from 29 days; for the month of Feb. in any other year, borrow from 28 days.

NOTE.

IT is perhaps due to remark, that, as many persons who are entrusted with the education of youth, seem solicitous for this work; the Author has concluded to delay it no longer; but to print the first half *only* of the whole, in the first Edition. The Author having been much afflicted for many years with ill health, has not been able to complete the other half: he hopes, however, to have the other half ready for the press shortly; and to have both parts then printed and bound together.

The following are the contents of the other half of the work, of which it will principally consist.

CONTENTS.

Compound Proportion.
Tare and Trett.
Method of computing interest on Notes and Bonds when partial payments, at different times, have been made.
Compound Interest.
Discount.
Commission.
Brokerage.
Buying and selling Stocks.
Insurance.
Duties.
Annuities.
Equation of Payments.
Barter.
Loss and Gain.
Single Fellowship.
Double Fellowship.
Duodecimals, or Cross Multiplication.
Examples for measuring Boards, Wood, Timber, &c.
Painters' and Joiners' Work.
Glaziers' Work.
Gauging.
Vulgar Fractions.
Single Proportion in Vulgar Fractions.
——————— Decimal Fractions.
Involution.
Evolution, or Extraction of the Square Root.
Extraction of the Cube and Biquadrate Roots.

MECHANICAL POWERS.

1st. The Wheel and Axle. 2d. The Lever. 3d. The Screw.

USEFUL PROBLEMS.

1st. To Reduce Two Rod Chains to Four Rod Chains.
2d. To Reduce Two Rod Chains to Rods and Decimal Parts.

3d. To Reduce Four Rod Chains to Rods and Decimal Parts.
4th. To Reduce Square Rods to Acres.
5th. To Reduce Square Chains to Acres.
6th. To Reduce Square Links to Acres.
7th. To find the Area of a Square or Parallelogram.
8th. To find the Area of a Rhombus or Rhomboides.
9th. To find the Area of a Triangle.

CIRCLES.

1st. The Diameter of a Circle being given, to find the circumference.
2d. The Circumference of a Circle being given, to find the diameter.
3d. The Diameter and Circumference being given, to find the area.
4th. The Circumference, or the Diameter only, being given, to find the Area.
5th. The Area being given, to find either the Diameter, or Circumference.

LAYING OUT LAND.

1st. To lay out any number of Acres in the form of a Square.
2d. To lay out any number of Acres in the form of a parallelogram.
3d. To lay out any number of Acres in a field which shall be 3, 4, 5, 6, &c. times as long as it is broad.
4th. To make a Triangle containing a given number of Acres, being confined to a certain Base.
5th. To cut off any number of Acres from a Square, or Parallelogram.
6th. To cut off any number of Acres by a Line proceeding from any Angle of a Triangle.
Alligation, Medial and Alternate.
Alternation, Partial and Total.
Permutation of Quantities.
Arithmetical Progression.
Geometrical Progression.
Single Position.
Double Position.
To measure the Solidity of any irregular Body, whose Dimensions cannot be taken.

MEASURING TIMBER.

1st. To find the solid Contents of a round stick of Timber, of equal bigness from end to end.
2d. To find the solid Contents of a tapering stick of Timber, (whether square or round,) when one end is a point.
3d. To find the solid Contents of a tapering round stick of Timber, when the small end is not a point.
4th. To find how many solid Feet a round stick of Timber, of equal bigness from end to end, will contain, when made square.
5th. To find how many square edged Boards of a given thickness, can be sawn from a log, of a given Diameter.

NECESSARY FORMS.

Notes, Bonds, Receipts, Orders, Invoices, Accounts Current, Drafts, Bills of Exchange, Deeds, Indenture, Will, Lease, Letter of Attorney, Bill of Sale, &c.

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